ARCHIVES OF OTOLARYNGOLOGY

VOLUME 3 MARCH, 1926 NUMBER 3

CANCER OF THE LARYNX

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Since 1844, when Ehrmann made the first surgical effort to cure cancer of the larynx, an ever increasing mass of statistics has accumulated. The earlier of these are historically interesting, but add little to the subject. They were based on no clear conception of what surgery might be expected to accomplish, since they failed entirely to distinguish between incipient and advanced disease. Great credit, however, must be given to these pioneers whose failures, stimulating renewed efforts in those coming after them, laid the foundation of our present better understanding and greater success. For many years, incipient cancer went unobserved, and to this, perhaps more than to a defective surgical technic, may be attributed the universal failure to cure. Not until 1876 was one cure reported, which was the ultimate gain in twelve laryngectomies.

From 1876 to 1886, one hundred and eight laryngectomies resulted in twenty-one cures. From 1886 to 1901 one hundred and eighty-six laryngectomies resulted in sixty-nine cures.

Chiari,[1] in 1909, in an extensive review of the literature, concluded that surgery was the only treatment that had given any positive cures, and stated that the results in extirpation of cancer of the larynx were better than those in other parts of the body.

The greater part of the statistics are inaccurate and unreliable, frequently omitting the end-results, the cases not being classified on selection. Accurate statistics can come only from extensive and reliable operators, who report all their cases good and bad and who classify them according to the location, nature and extent of the disease. The statistics of Bergmann, Kocher, Mikulicz, Butlin,[2] Schmiegelow,[3]

1. Chiari, O.: The Treatment of Cancer of the Larynx, Ann. Otol., Rhinol. & Laryngol. **18**:211-242 (June) 1909.

2. Butlin, Henry: On the Results of Operations for Cancer of the Larynx, London, Adlard & Son, 1908 (pamphlet).

3. Schmiegelow, E.: The Results of Operation (Laryngofissure) for Intrinsic Cancer of the Larynx, Ann. Otol. **23**:523-528 (Sept.) 1914.

Fischer, Thomson,[4] Semon, Jackson,[5] Lewis,[6] Moure,[7] and others, are the most reliable, though forming but a small percentage of all reported cases.

Much confusion exists in many of the statistics on the question of permanent cure; Semon held that no recurrence after one year might signify a cure, a position untenable, since in a few of my own cases recurrence has been noted between the second and seventh years. Maydl, Scheier, Wassermann, Seudziak and Delavan believe that a period of three years should elapse before placing any given case on the cured list.

It cannot be stated, in the face of our present undertanding of the disease, that cancer is cured until the patient dies of some other disease. Cancer, syphilis and tuberculosis may be arrested. If cancer, like the other two of this triad, is a constitutional disease, in favor of which there is some clinical evidence, it would be more accurate to say that its local manifestations have been arrested.

The operations which come under consideration for the radical cure of cancer of the larynx are: Intralaryngeal extirpation, thyrotomy or laryngofissure, partial and total laryngectomy, and in rare instances, subhyoid transverse and lateral pharyngotomy.

INTRALARYNGEAL EXTIRPATION

Every cancer victim is prone to seek a cure when much is promised through the least radical procedure; a desire met more than halfway by the unscrupulous whose cupidity stops not even at the sacrifice of human life. Reports of cures of extensive cancers, even extrinsic, are not wanting to bolster up the intralaryngeal method. It must be evident to all that beyond biopsy for diagnosis this method should not go.

It has always been the opinion of the majority that biopsy is harmless. John MacKenzie, in 1900, was the first to sound a note of warning. He said: "The removal of a piece for microscopic examination too often means the beginning of the end." The proponents of this method of diagnosis do, however, admit that any incomplete removal of a carcinoma may stimulate its growth. Chiari [1] would have the major operation follow on the biopsy as quickly as possible, thus negating to

4. Thomson, St. Clair: Cancer of the Larynx, Lancet **2**:163-165 (July 22) 1922.

5. Jackson, Chevalier: Cancer of the Larynx. Is It Preceded by a Recognizable Precancerous Condition? Proc. Am. Laryngol. Soc., 1922; The Results of Operative Methods in the Treatment of Cancer of the Larynx, Tenth International Congress, Paris, July 19-22, 1922.

6. Lewis, F. O.: Early Diagnosis and Treatment of Malignant Disease of the Larynx, Atlantic M. J. **26**:797-799 (Sept.) 1923.

7. Moure, E. J.: Remote Results of Laryngectomy for Cancer, Bull. de l'Acad. de med., Paris **85**:257-259 (March 1) 1921.

some extent his assertion that biopsy is harmless. He performed several intralaryngeal extirpations with a complete failure in all, and condemns this method. Okada of Tokio, Japan, has performed extirpation of minute cancers of the cord and epiglottis with satisfactory results, five subjects being completely cured; yet he warns against its use as a procedure to replace the more radical methods. Yankauer has recently championed this method, and reports good results even in fairly advanced cases, but he is not quite clear on time limit. Schmiegelow [3] secured one cure in five cases. Lewis,[6] mentions this operation in a paper written in 1923, and states that it is generally condemned, and if attempted he believes it should be only in the most incipient growths strictly confined to a small area. In an extensive perusal of the literature, I found scant mention of intralaryngeal extirpation and much evidence to condemn it. The few reported successes prove nothing, when we have in mind the variability in the malignancy in cancer, and serve only to keep alive an evil method which should have been buried years ago.

THYROTOMY OR LARYNGOFISSURE

This operation was devised in 1833 by Browers for polypi, and was adopted by Ehrmann in 1844 for cancer. His case was so imperfectly reported that it made no impression on the surgery of his time. The honor of first properly reporting this operation for cancer of the larynx should go to Gordon Buck, an American, in 1855. His patient died of cancer ten months later. Solis Cohen repeated the operation in 1868 with a cure. In 1878, P. Bruns presented nineteen thyrotomies (not including Buck's and Cohen's cases) performed on fifteen patients, four of whom were twice operated on. In all but one there was recurrence, and this one died twenty-two months later of cancer of the kidney, the larynx remaining free. The recurrences were immediate and the progress of the disease was rapid. This gave thyrotomy a serious setback for many years. In 1881, Yontis and Czerny contended that cancer of the larynx could be cured by total laryngectomy alone. Butlin [2] at first concurred in this opinion. It is to Felix Semon's plea for an early diagnosis that we owe the reestablishment of thyrotomy and the reconversion of Butlin to this method. The keen observation and skill of these two Englishmen revived general interest in thyrotomy which, when its proper limitations were apprehended, began to give encouraging results. It became apparent that this operation was suitable only for incipient cases. The exact meaning of incipient must be left to the future for determination, since the controversy is still going forward though, I am glad to say, less acrimoniously than formerly. As experience accumulates, the sphere of thyrotomy contracts. It is on the fixation of its limitations that we are not yet all in accord. The low

mortality of thyrotomy during this period stood strongly in contrast with almost prohibitive surgical mortality of total laryngectomy; hence the position of these contending methods was reversed and thyrotomy became the almost universally accepted method of dealing with laryngeal cancer in all stages.

It must be conceded that thyrotomy is an ideal operation, providing its limitations are understood and strictly adhered to. Too often these are set aside, owing to the patient's urgent desire to save his larynx and the surgeon's lack of courage to face the more radical operation which, up to recently, had so dark an outlook. My personal experience with this operation has not given the brilliant results published by others which impels me to take a most conservative attitude toward it. I would place the ban on all posterior third growths; on those in the anterior commissure crossing the midline; on rapidly growing cancers of any size or in any position, especially in the young; on cancers starting in the deep structure of the larynx; on growths occupying over one-third of the extent of the cord in any position; on growths appearing small with incipient loss of cord function; on bilateral cancers of any size. We have for thyrotomy, therefore, middle third cord growths involving only the surface of the vocal or ventricular bands, circumscribed and small in extent and of slow growth. Unfortunately, too few such cases have come under my observation.

Several points arise in the technic of thyrotomy which deserve special consideration. Operators are divided on the use of the tracheal cannula and tampon. Jackson,[5] Lewis[6] and St. Clair Thomson[4] leave the trachea exposed but do not open it unless complications arise. Bruns, Moure, Pieniazek and many others prefer the cannula and tampon. I perform a median or a low tracheotomy, and fill the space between the cannula and the larynx with a tampon on a double puckering thread. The tampon is saturated with yellow petrolatum stiffened with a little wax and bismuth, its end being brought out through the lower angle of the laryngeal wound. When the tampon is in place, the threads are drawn, thus approximating its ends and wedging it into the space above the cannula as snugly as is desired. This effectively prevents wound secretion, saliva, food and blood from entering the trachea. It is retained for about five days. On the fifth or sixth day, the cannula is removed. Posture does not prevent secretions and food from entering the trachea even when the patient is in the ventral position. If the operation has been extensive, deglutition may temporarily be deranged, allowing food and mouth secretions to enter the larynx. A naso-esophageal feeding tube extending half way down the esophagus obviates this danger.

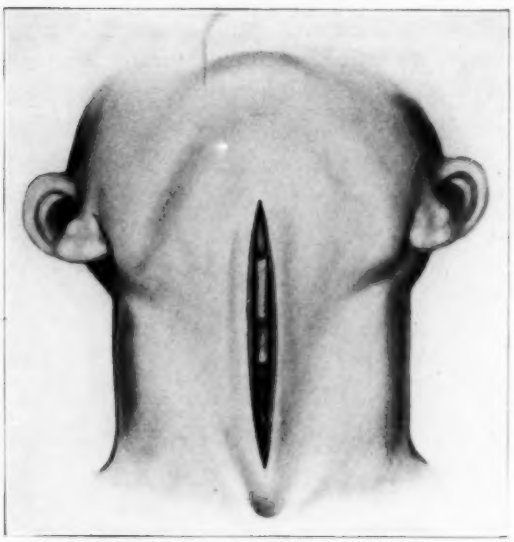

Fig. A.—Laryngofissure incision.

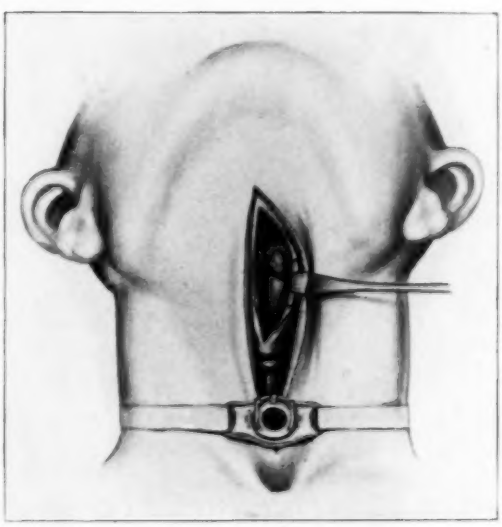

Fig. B.—Laryngofissure, thyroid cartilage opened, cricoid ring intact, tracheal cannula in place.

If the growth is lateral and is well away from the anterior commissure, the larynx is opened in the center line, cutting through both external and internal perichondria, with special scissors introduced into the larynx through the cricothyroid membrane, or better, with knife and fine saw. The force needed to cut through a partially ossified larynx with scissors may, by crushing or fracturing the cartilage, retard heal-

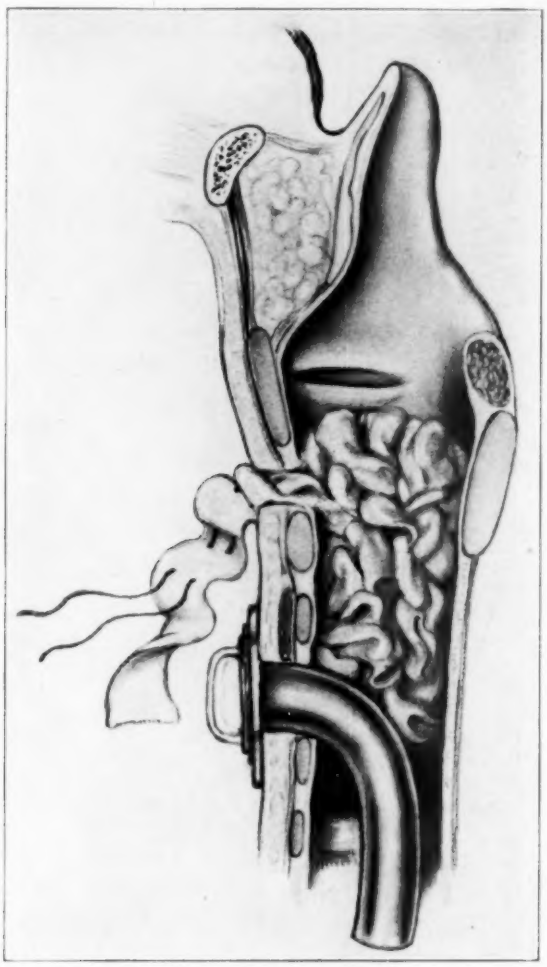

Fig. C.—Laryngofissure. Lateral view showing cannula and plug in place.

ing. It is essential to make a straight cut from the skin into the larynx, to avoid any lateral separation of the soft parts from the thyroid cartilage and, most particularly, the external perichondrium from the cartilage.

In anterior growths, Jackson's method of entering the larynx is quite ingenious. To avoid bisecting the growth, he cuts through the

cartilage with knife and saw until the internal perichondrium is reached. This he detaches by careful dissection from the cartilage over an area wide of the growth. The section of intralaryngeal tissue thus raised is then excised wide of the diseased tissue.

The cricoid ring should never be incised, for if the growth is extensive enough to require this, total laryngectomy should be done. There are two reasons for not suturing the wound: an open wound allows free drainage from the interior of the larynx; the cartilage should heal before the superimposed soft tissues, in order to obviate

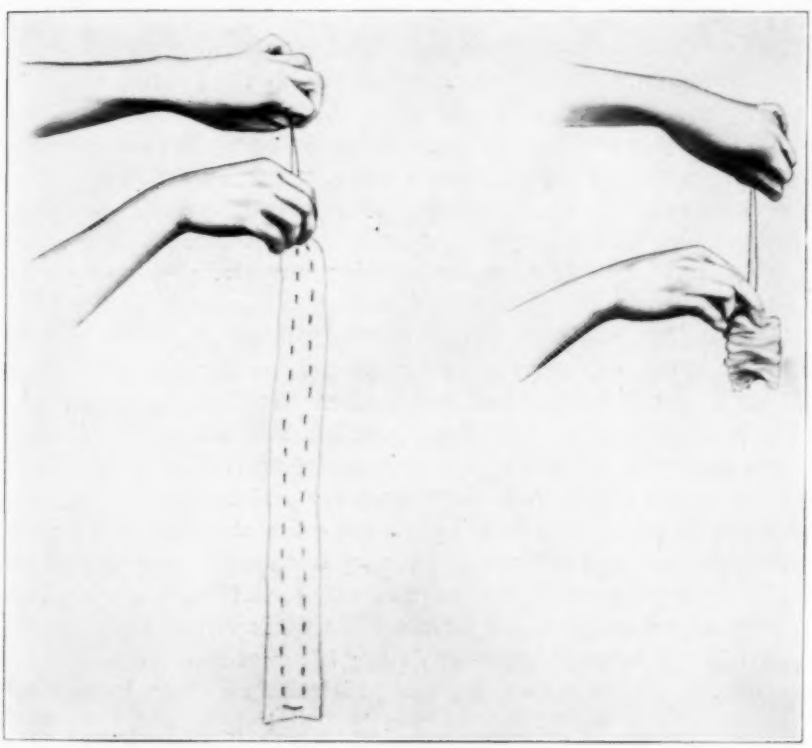

Fig. D.—Method of making plug with drawing string. The drawing of the string makes the plug fit as tightly as desired. Bismuth vaseline or paraffin gauze is used.

cartilage necrosis and consequent granulomas forming in the larynx. The surface over the wound is covered with a pad wet in saline solution. If the wound tends to gape, one stitch through the soft tissue at the upper margin of the thyroid cartilage may be used and retained for a few days.

Chiari [1] reports forty-one thyrotomies with three operative deaths, eleven recurrences and fifteen cures. The twelve remaining cases were

too soon after operation to be tabulated. Schmiegelow [3] had fifteen recurrences in thirty-three cases.

Gluck,[8] in 1912, reported thirty-five operations with no mortalities, and later five with two deaths. In the thirty-eight living patients there were only two recurrences. No time limit is given in these statistics, which may partially account for results far beyond any reported in the literature up to that time.

Lewis [6] reports two cases with one recurrence.

Butlin,[2] in 1908, reported forty-one operations on thirty-seven patients, thirty-one of which were thyrotomies. There were five operative deaths and fifteen patients were living after three years. In this paper he regrets his conservatism, and gave expression to the belief that total laryngectomy would have saved several of the patients who died from recurrence after thyrotomy.

St. Clair Thomson,[4] in 1922, reported fifty-one thyrotomies with two fatalities. Thirty of the forty-nine are alive and free from recurrence at periods varying from one to thirteen years. Eleven more survived up to ten years and died of other diseases. The inference is, though not stated in this report, that nine died of recurrence. He reports two operative deaths.

Jackson,[5] in 1922, adds forty-five cases with no surgical mortalities, and with about a 20 per cent recurrence. In twelve subjects, Okada had eight recurrences and two deaths after operation.

Between 1906 and 1920, eight laryngofissures and twelve window resections were performed by me,[9] with seven recurrences in the former and eight in the latter. A total laryngectomy performed on three of the patients with recurrences failed to arrest the disease. It must be stated, in vindication of this operation, that many of these subjects were, from lack of experience, poorly selected and were too advanced for anything but a total extirpation of the larynx. The window resection is, in my opinion, a questionable procedure, since it removes a barrier against extension in the event of recurrence and leaves an open pathway for direct invasion of the neck. Between 1920 and 1924, two thyrotomies were performed, with no recurrences after three years and two years. At the time of writing, one patient, on whom thyrotomy was performed eight years ago, is dying of a local recurrence.

HEMILARYNGECTOMY

The first partial removal of the larynx was performed by Maas of Breslau in 1876. In 1878, Billroth of Vienna removed half of the

8. Gluck, T., and Sverensen, J.: The Surgical Treatment for Cancer of the Larynx, Jahrb. f. ärztl. Fortbldg. **3**:20 (Nov.) 1912.

9. MacKenty, John Edmund: The Technic and After Treatment of Total Laryngectomy, J. A. M. A. **69**:863 (Sept. 15) 1917; Surgical Treatment of Laryngeal Cancer, Boston M. & S. J. **177**:110 (July 26) 1917.

larynx giving the operation its name, "halbseitige" extirpation and so popularized the operation that Sendziak, in 1907, was able to collect two hundred and twenty-four cases from the literature. About this time Chiari reported thirty-two patients with recurrence in fifteen, in one as late as six years after the operation. Koschier reports a 62 per cent recurrence in his personal cases. Prior to 1917, I performed six hemilaryngectomies with no immediate fatalities, but with a 75 per cent recurrence. Gluck's [8] report of forty-two cases without fatality is worthless, since it makes no note of recurrences.

TOTAL LARYNGECTOMY

The first total extirpation of the larynx was performed by Watson in Edinburgh in 1866 for syphilis. Billroth, relying on successful experiments on dogs made by his assistant Czerny, performed the first total laryngectomy on man for cancer on Dec. 31, 1873. The patient survived the operation but died of recurrence eight months later. Sendziak collected the statistics on about 500 operations prior to 1907.

In 1881, Gluck, realizing the danger of aspiration pneumonia and neck infection, devised the two stage operation. Two weeks before the major operation, he severed the trachea from the larynx and sutured it to the skin. The bringing together of the skin and the tracheal mucosa was a technical advance and marked the first step toward the present technic. But Gluck was not content with his two-stage operation, and eventually he discarded it for the one stage operation, in which he released the larynx and upper part of the trachea from their attachments and then severed the larynx from the trachea and sutured the tracheal stump to the skin. Before detaching the larynx from the trachea, he closed the hypopharyngeal defect. The trachea and larynx, thus raised above the wound level, partially prevented the entrance of blood into the lung during the operation.

There was, however, one serious defect in this most ingenious procedure. From the moment the thyrohyoid membrane was incised and the hypopharynx was opened, until the larynx was raised, there was danger of blood flowing through the larynx into the lung. It is now known that blood in the lung cannot be expelled when the trachea is open, since the cough mechanism (air compression behind a closed glottis and sudden expulsion of air) is abolished. We also know that a small quantity of blood entering the lung acts as a foreign body and may cause pneumonia. Hence I have modified this method, details of which will appear later in the text.[10]

10. MacKenty, John Edmund: Operation of Total Laryngectomy for the Cure for Intrinsic Cancer of the Larynx, Ann. Otol., Rhinol. & Laryngol. **31**:110 (Dec.) 1922; The Operative Treatment of Cancer of the Larynx, J. Laryngol. & Otol. **39**:67 (Feb.) 1924.

The two-stage operation, variously modified, has still a useful place in cases of dyspnea due to obstruction from cancer or from radium reaction. This procedure may be used to replace tracheotomy. Since it is a much more formidable operation than tracheotomy, its employment must depend on the condition of the patient. In a few patients, I have employed the transverse tracheotomy incision which does not destroy the tracheal rings and leaves a better tracheal stump for repair, when the subsequent total laryngectomy is done. This method is not a two-stage operation as it is now done.

In the opinion of Chiari and Gluck, total laryngectomy, is surgically safer than partial laryngectomy, and it surpasses all other procedures in the percentage of cures. This is undoubtedly true, providing all operative procedures have an equal start. Laryngectomy, now being reserved for the more advanced subjects, has, of necessity, a serious handicap. It, therefore, appears in the statistics that eventual successes are about equal or perhaps a little in favor of thyrotomy. Theoretically, under ideal diagnostic conditions, total laryngectomy should always hold second place. But unfortunately, such ideal conditions do not prevail and the patients in the incipient stages rarely come under the expert's observation. In some of the individual statistics, the cures following thyrotomy pass credence. Is it possible that these operators live in a superintelligent environment, in which early diagnosis is unfailing?

In spite of an extremely high mortality, Schmiegelow, reviewing his personal cases, claims that cancer of the larynx, in the operable stage, is more hopeful than cancer in any of the concealed parts of the body. Fifty-two patients were operated on by him; five endolaryngeal operations gave one cure; thirty-three thyrotomies gave eighteen cures; one subhyoid pharyngotomy and four partial resections of the larynx, no cures; nine total laryngectomies, one cure. Five of his thyrotomy patients died of pneumonia due to postoperative hemorrhage. The eighteen cures by thyrotomy were in patients with an incipient growth on one cord. The functional results in these were satisfactory. The extremely high operative mortality in the thyrotomy subjects argues for tracheotomy and tamponage, and the eight recurrences in nine total extirpations must mean that he operated on patients on whom the disease was hopelessly advanced.

Gluck's and Sverensen's review of their work gives results far beyond anything then accomplished. There were forty-five thyrotomies with two fatalities; both occurring in old and diseased patients. Only two of the survivors had a local recurrence. This is an amazing record and, even in the light of the present knowledge, seems almost miraculous. No one before or since has claimed such immunity from recurrence. Hemilaryngectomy was performed forty-eight times with three fatalities in the first twenty-eight of this series and sixteen recurrences. Of 160 total laryngectomies, the last sixty-three were performed without a fatality.

No statement is made on the surgical recovery of the remaining ninety-eight patients. These investigators can account for forty-five cures in 160 operations performed up to the end of 1911.

Contrast the foregoing with Sendziak's statistics gathered in 1897: cured after three years: laryngofissure, 8.7 per cent; partial resection, 11.8 per cent; total laryngectomy, 5.8 per cent. Assuredly, great advance has been made in the last twenty-five years.

Lewis,[6] reviewing this subject in 1923, does not favor the endolaryngeal approach. He limits thyrotomy to incipient anterior cord growths in which a liberal margin of normal tissue can be assured. When in doubt as to the best procedure, he advocates slitting the larynx and proceeding on the opinion then formed. He reports two laryngofissures with one recurrence. He feels that partial laryngectomy, because of the pulmonary risks and the high mortality, should seldom be employed. Of total laryngectomy he has much to say in its favor, and regrets that it is too seldom employed and often far too late. He reports seven cases with one surgical death from embolus. Three subjects died of recurrence and the others are too recent to be classed as cured. In a personal communication (1924), Lewis states that he has performed forty-three laryngectomies with two fatalities. Six of these operations have been performed within the year. Of the thirty-seven cases, nineteen were intrinsic. No recurrences have been noted in these subjects.

In 1919, Hoshino [11] of Japan reported sixteen complete extirpations with no fatalities and 50 per cent recurrence. He feels that this high recurrence could easily be obviated if the patients came earlier to the radical operation. He advocates the double flap approach and the removal of the larynx from below upward.

Moure,[7] in 1921, gave his experience with thirty-one cases of total laryngectomy, stating that under modern technic it is a relatively benign operation. He reported eleven cures. He strongly advocates the one stage operation. It is interesting to note that, in his experience, radium and the roentgen ray have produced no results.

In 1908, Butlin [2] reviewed all his cases to date. Thirty-seven patients underwent forty-one operations (thyrotomy, hemilaryngectomy and total laryngectomy). Fifteen patients remained cured for three years or longer. His operative mortality was high, judging from the results of later operators, but excellent for the time over which the work extended. In his last thirty-one operations there were only two fatalities. This he attributes more to the defective aftertreatment than to the operation itself. These two deaths occurred in extremely bad

11. Hoshino, T.: The Complete Extirpation of the Larynx in Carcinoma, Ann. Otol., Rhinol. & Laryngol. **28**:466-472 (June) 1919.

risks. This wonderful surgical achievement places Butlin in a class by himself and on a par with Gluck. He draws no conclusions on this small series, but expresses the regret that he had not taken up total laryngectomy earlier, since he feels that many of the recurrences could thus have been avoided. He advocates the removal of the cervical glands in all extensive intrinsic carcinomas, especially if the disease extends to the posterior zone of the larynx. He objects to the removal of the glands and the larynx at one sitting.

Robert Woods [12] (1922) contributes some interesting thoughts on this subject and a careful review of his work. He dwells particularly on the danger of septic infection and on the great advance made since the feeding tube was introduced. Twenty-one total laryngectomies are reported, of which three patients succumbed to the operation. The recurrences were nine within three years, one within five years and one within eight years. Nine subjects are still living after three years. His observation on the enjoyment of life in these subjects corresponds with my own. "It may be said that they are hardly worse off without the larynx than with it. Swallowing is not interfered with. The tendency to bronchitis, which everyone assumes when the protection of the upper air passages is abolished, seems to be not greater than, or even as great as, among ordinary folk. There remains the problem of speech; this, however, depends less on the operation than on the intelligence and quickness of the patient." I have quoted at length from Dr. Woods' paper, hoping to dispel the misconception on the part of the profession and laity alike on the postoperative mental and physical condition of the patient. This gloomy outlook has been a serious barrier to the adoption of this life saving operation. For the incipient cases, Dr. Woods advocates thyrotomy; fixation of the arytenoid and involvement of the cartilaginous framework of the larynx are his indications for laryngectomy.

The American workers in this field must consider such a classification entirely inadequate in determining the type of operation adapted to any given case, and they must feel that to wait for such gross manifestations of the disease before doing a total laryngectomy leads to a high recurrence. Dr. Woods' statistics justify this statement. Long before the foregoing signs appear, the condition is ripe for the most radical procedure.

George W. Crile,[13] in discussing Dr. Woods' paper, makes the following encouraging statement: "There is no surgical operation that offers so certain and so permanent a cure for cancer as total laryn-

12. Woods, Robert: Laryngectomy, Surg., Gynec. & Obst. **34**:297-305 (March) 1922.
13. Crile, George W.: Laryngectomy, Surg., Gynec. & Obst. **34**:305-306 (March) 1922.

gectomy in intrinsic cancer of the larynx." Of forty-one total laryngectomies, thirty-five were performed by the two-stage method, which he describes in detail. In these thirty-five operations there were two fatalities. The larynx and trachea are skeletonized. The trachea is surrounded by iodoform gauze, which is packed in deeply along the sides of the larynx. The larynx is removed at a later operation. He believes that this method obviates mediastinal infection and interference with pneumogastric nerve function. His feeding is accomplished by a permanent tube passed through the stomach into the duodenum.

Gustav Hofer and Karl Kofler [14] report as follows on the work done in Chiari's Clinic, University of Vienna.

In a review of the literature between 1898 and 1918, they found the percentage of complete recoveries to be from zero to 60 per cent, the latter representing the best results obtained. In their personal cases, weak and undernourished persons, though passing through the surgical period successfully, often died later of one of the many complications incident to the operation. Thyrotomy was performed on all patients in whom the disease had not reached the posterior commissure and in whom the cord was still movable. The affected cord was entirely removed with or without the arytenoid.

These investigators lay great stress on the use of the tampon, which is left in place for six days, if possible. It serves a triple purpose: First, the protection against entrance of secretions from the wound, pharynx and mouth into the trachea. Second, the control of postoperative hemorrhage. Third, the direction of secretion from the bronchi and lungs toward the cannula. A second tampon is placed in the wound bed for drainage and is changed as often as indicated. All vessels are carefully secured by a transfixion ligature.

In five years, twenty-one thyrotomies were performed. Twenty-one operations with four deaths (one from infection in the wound bed and three from hemorrhage). Of seventeen remaining, eight were under observation for three years and nine for one year or over. There were no recurrences. The absence of recurrences they attribute to careful selection and thoroughness in the operation.

The following observation is quoted:

> It would seem that a painstaking cleansing of the mouth and teeth should be a self-evident requirement, and still the fact remains that the worst forms of postoperative infection with resulting deaths occurred in patients in whom a careful cleansing of the mouth and teeth had been done. We offer as an explanation the setting up of an acute inflammation of the mucous membrane, thus substituting an existent avirulent pyorrhea for a virulent one. In the patients in whom no cleansing has been undertaken, no septic complications have occurred. In the light of our experience, we now refrain from any vigorous ascepticization of the mouth.

14. Hofer, Gustav, and Kofler, Karl: Ueber die Auberen Larynx-Operationen Wegen Maligner Tumoren, Wien. klin. Wchnschr. **31,** 1918.

(I cannot agree with this, and would amend it by suggesting that the mouth hygiene be accomplished a week or more before the operative period.)

In unilateral laryngectomy, they conclude that unless the entire mucous membrane and posterior surface of the cricoid can be preserved, a total extirpation should be done. To do otherwise would mean a displacement of the side operated on, causing misdirection of food and respiratory difficulties.

These investigators insist on the removal of the glands in all advanced intrinsic cases.

Sixteen unilateral operations were performed. Of these, one patient died from hemorrhage; six patients died from pneumonia; four had recurrence; one patient is still under treatment; and in four patients there were no recurrences.

They agree with the author in questioning the wisdom of this operation.

In total extirpation, a tracheotomy is performed either a few days before or at the time of operation. Great stress is laid on the importance of securing a large and permanently patulous tracheal opening (tracheastoma) and on the undesirability and danger of the permanent cannula. A flap may be taken from the posterior surface of the cricoid and united with the skin, or the trachea may be cut diagonally across, thus securing a large oval opening.[15] In postoperative hemorrhage, they advise that the entire wound be laid open, the bleeding controlled and the wound packed.

Thirty total laryngectomies were performed. Of the ten deaths, four patients died from hemorrhage; one patient from phlegmon, and 5 patients from pneumonia. Of the twenty survivors, there were four recurrences; twelve patients were under observation for over one year, and four were under observation for over three years. (The results set down in this report compare most unfavorably with those secured in America and in England.)

The following is an extract of a paper on this subject by A. G. Tapia of Spain:

> In most cases, treatment of laryngeal cancer with radium or roentgen rays fails to arrest the progress of the disease. It may, on the contrary, aggravate the cancer, or, by impairing the condition of the skin, prevent or complicate radical operation. Adequate roentgen-ray and radium equipment were employed in sixty-seven cases. Since there is no way of determining in which cases the roentgen rays or radium will act favorably, the rational treatment of laryngeal cancer is surgical. The roentgen rays or radium should be limited to inoperable cases or to those in which operation is refused, or they may accompany surgical treatment. The importance of early diagnosis should be

15. Personal experience condemns diagonal section of the trachea, since it destroys the rigidity of the rings, allowing great contraction later of opening.

generally understood in order that patients may be given the benefit of thyrotomy, hemilaryngectomy, and other slightly mutilating operations. Laryngectomy is not a serious procedure. It yields excellent results in subjects not amenable to simpler methods, and is applicable to subjects in whom extirpation of the larynx is practicable, even though extension beyond the larynx has begun. Here operation should be followed by roentgen-ray treatment. Laryngectomy is contraindicated if extension is considerable, reaching the base of the tongue or the lateral pharyngeal wall, or involving the lateral glands in a notable degree. It should rarely be preceded by tracheotomy, as the latter procedure may render laryngectomy difficult. Tracheotomy is indicated only if asphyxia is menacing. With glottic or supraglottic tumors, the incision is made between the cricoid and thyroid, the skin being incised vertically, the membrane transversely. A Botey or other thin cannula is employed. With infraglottic tumors, the incision is made as low as the third or fourth tracheal rings. If the patient's neck is wide and short, the region of the first ring may be incised.

Laryngectomy should be done in one sitting under local anesthesia. The regional infiltration or nerve-blocking methods of local anesthesia are both practicable. I prefer placing a cotton pledget, moistened with cocain solution, in contact with the superior laryngeal nerves, which accompany the superior laryngeal arteries. Excellent anesthesia may also be obtained by similar contact anesthesia of the recurrent nerves. I inject morphin ten minutes before begining the operation. The method employed is essentially that of Gluck. The muscles in front of the larynx should be removed, and the larynx freed from above downward. Two drainage tubes are placed on each side. The trachea is sutured to the skin exactly opposite its mucosa, and no structures are dissected free below the cricoid cartilage. Separation of the posterior tracheal wall, as well as perforation, must be avoided. The more perfect the operative technic, the less postoperative treatment will be required. The patient should breathe humid air. The surrounding temperature should be from 15 to 18 C. The patient should lie in bed, on the side or back, as desired. He may sit up after twenty-four hours and may leave the bed in three days. For eight to ten days, he is fed through the nasal tube. Normal feeding may then be resumed, provided deglutition does not cause saliva to escape from the drainage tubes. The dressing and cannula are changed in twenty-four hours. The drainage tubes need not be changed before the third day, unless marked rise of temperature requires it. After the third day, the wound is dressed and exudates are removed daily. Oral disinfection with hydrogen peroxide is desirable for the first few days. Shock, infection, etc., will be treated according to usual indications.

In ninety-eight patients operated on as described, no tracheal gangrene occurred. Of 106 cases treated by laryngectomy, none was fatal. The first patient ever operated on by me was lost by bronchopneumonia caused by aspiration of food. Good phonation is obtained. A voice satisfactory for brief conversation may be obtained without apparatus. The cancer recurred in thirty-two cases.

The results here detailed are remarkable and have not, so far as I am aware, been duplicated by any one either here or abroad. In an operation, circumvented by so many and such fatal complications, I fail to understand how any operator could have had the good fortune to escape them all. My experience, however, leads me to believe that the Spaniards are a vigorous race. More than twenty-five of my patients were Spanish Americans and none of them died from the results of the operation.

DIAGNOSIS

Little need be said on late intrinsic and extrinsic cancer, since the former is easily recognized and the latter is practically hopeless. Judging from the advanced condition of the great majority when they come for operation, the diagnosis of cancer of the larynx must be either extremely difficult or poorly understood by the profession. In hundreds of patients seen by me, a pathetically small minority can be assured of a hopeful outcome. In many instances the fault lies with the patient in not seeking an opinion earlier, but in far too many they have been under observation and treatment for months. A common stumbling block is the presence of a positive Wassermann reaction. Precious time may be wasted in prolonged and repeated antispecific treatments. Depending on the hope that the disease is syphilitic in nature, both patient and doctor are lulled into a sense of false security out of which they emerge too late. For a time quiescent or its progress escaping observation, the disease suddenly takes on the more sinister unmistakable characteristics of malignancy. Sometimes the growth recedes perceptibly under antispecific treatment and reaches a temporary stand. This may be due to the dual nature of the disease (syphilis or cancer) or to a retarding effect of the medication. I have observed the latter effect in certain cancers when there was no evidence of a concomitant syphilis. This retardation again disarms suspicion and seems to justify another period of antispecific treatment. It cannot be too emphatically stated that pure laryngeal syphilis recedes with unmistakable rapidity under antisyphilitic treatment, and that any condition not conforming to this rule must be scrutinized with grave suspicion.

Another and less excusable obstacle is the pessimistic attitude of some members of our profession toward the surgical cure of cancer of the larynx. In several instances in my experience the relatives of patients (now apparently cured by operation) were told by the family physician that surgery was futile, and that death by either the operation or the disease was inevitable. In the light of the propaganda now being sent forth against cancer, I cannot believe that this stand is maintained entirely on ignorance.

It is fortunate that intrinsic cancer of the larynx usually has its inception on one or the other vocal cord, or in such proximity to the cords that interference with their function is an early and detectable symptom. In the rare instance in which the growth starts above or below the cords, great advance may occur before the victim is aware of his peril since neither pain nor other sensation may be felt. When the initial growth is above the cords, early lymphatic involvement soon puts the condition beyond hope of cure. Hence our interest and hope must center in the cases in which cord involvement gives early notice,

in an altered voice, of some pathologic condition in the larynx. Hoarseness, therefore, is an early and important symptom. In many patients we get the history of chronic hoarseness varying in intensity and in duration and often showing seasonal variation. This predicates some chronic nonmalignant or perhaps premalignant condition. The persistence and deepening of this hoarseness in one of cancer age must arouse suspicion. When the larynx and the voice have been normal prior to the onset of the disease, the diagnosis is less difficult. When cancer has become grafted on other pathologic conditions such as chronic laryngitis, specific laryngitis, papilloma, etc., our task becomes much more complicated; yet painstaking repeated observations must in a short space of time disclose the true trend of events. It has proved useful during this period to make careful sketches of the picture presented in the laryngeal mirror or by endoscopy. A Leitz sunlight lamp or direct sunlight greatly improve definition of contour and color. Careful training of the patient for days may have to precede this period of study, in order to control unruly reflexes and an understandable nervous apprehension on his part. In advanced disease, one look is often sufficient for a positive diagnosis. But in the incipient conditions a hasty opinion should be avoided.

Cancer never appears simultaneously in two places in the larynx. A cancer on one cord may rarely graft a similar growth on the opposite cord, but this secondary growth always gives evidence of its later inception. When this occurs the incipient stage is long past. Therefore, in looking for cancer we must look for a single outcropping, if it is on the surface, or a single localized bulging if it is deeply situated. Experience tells us that usually the surface is the point first attacked, that any part of the cord may be involved, with a strong predilection for the anterior two-thirds. I have never seen a cancer start in the interarytenoid space, so frequently the seat of tuberculosis. The surfaces of the true cords, their proximal walls, the ventricle [5] of the larynx and the anterior commissure are usual situations for cancer. Perhaps the upper surfaces and edges lead in frequency. The deeper growths have a tendency to appear in proximity to the cords and in the anterior two-thirds of the larynx.

More rarely, cancer appears in the following situations: at the base of the epiglottis; between the base of the epiglottis and the anterior commissure; on one or other arytenoid; on one aryepiglottic fold, in the pyriform fossa, on the laryngeal wall below the cord. All of these, excepting the last, must be classified under extrinsic growths and even when removed early and radically are too often hopeless. Here the cervical lymphatics involvement may be synchronous with the laryngeal growth and generally long before any abnormal sensations obtrude

themselves on the victim's consciousness. Since growths in these regions do not cause hoarseness or any discomfort, they are rarely discovered in time to enlist the surgeon's aid. It is pathetic indeed that our life saving efforts should be confined to so limited an anatomic area, yet consoling to know that in this area 80 per cent of cancers of the larynx have their inception. It might be appropriately named the laryngeal cancer area.

When one undertakes to tell of the characteristics and behavior of a laryngeal growth which mark it as cancer, the task is well nigh impossible. Years of painstaking observation brings into play a subconscious knowledge which cannot be sized and labeled. This crystalized experience must be drawn in the making of any clinical diagnosis and, to an unusual extent, in the diagnosis under discussion. To all who are interested in this study I would suggest careful, repeated and unbiased observation in every case, with notes and sketches of these observations.

Incipient cancer in an otherwise normal larynx has the following distinguishing features. It has none of the appearances of inflammation. The area around the minute excrescence or bulging irregularity of surface may be normal in color, or paler than normal and raised above the surrounding surface. It is rarely pedunculated, and is usually flatly sessile and irregular in outline, with little or no demarkation from the normal surrounding tissue into which it fades. It may present early a broken, warty abraded appearance. Its base or point of emergence from the normal tissue may exhibit vascular activity, as shown by dilated surface venules. Rapid growths often take on a pale yellow or dirty white appearance and suggest, in the diminutive, the later well-known cauliflower appearance of malignancy. In the beginning, subsurface cancers have none of the foregoing characteristics, and the advance may be considerable before they appear. Here infiltration into the muscles, causing diminution in mobility of the affected cord, may antidate any diagnostic surface change.

Quite different again may be the picture presented when cancer appears in an already diseased larynx. The precedent pathology may be simple, chronic, specific or tubercular laryngitis, single or multiple papilloma, pachydermia laryngis, hernia or prolapse of the mucosa lining the ventricles, fibroma, etc. Here we are confronted with a problem most difficult of solution. If the chronic condition has been under observation prior to the onset of the malignancy, and especially if these observations have been painstaking and correctly recorded by note and diagram, we are better enabled to differentiate the old from the new pathology and to arrive earlier at a correct conclusion. Unfortunately, in this tangle we may have no such advantage. I am here considering the diagnosis of incipient cancer. The moderately advanced disease usually has its character stamped on it. In order to

arrive at a conclusion within a safe time limit, two procedures are open: (1) repeated and careful examination extending over a few weeks; (2) biopsy. Unless grave reasons for haste exists, the former should be adopted and the latter employed only when an impasse is reached and a positive diagnosis cannot be made by observation. Of the two methods my reliance is on the first, and unless the second gives positive confirmation of the presence of cancer it should be disregarded. A strong suspicion of malignancy clinically should not be weakened by a negative microscopic finding. Repeatedly, we see hopeless cases in the early stage of which biopsy was negative; hence implicit reliance on this test should be strongly deprecated. It too often serves as an excuse for careless clinical study and in its negative findings sets both patient and doctor off their guard. This is understandable when we realize that biopsy is often badly done; a surface specimen only being secured, leaving behind the characteristic pathology which lies deep at the base of the neoplasm. A positive specimen must settle the question if two reliable pathologists agree on it. This dual opinion is not an idle precaution to those of large experience in this field. In the early change from normal to malignant, even the microscope may encounter difficulties in reaching a positive stand. It is my habit, when opinions differ, to fall back more confidently on the clinical evidence and to wait for more positive clinical signs. Thus, in a few personal instances, operation has been avoided.

To emphasize more thoroughly the paramount value of careful clinical study in laryngeal cancer, I shall mention four cases in my records in which the clinical aspect of the disease was nonmalignant, but in which biopsy showed malignancy. The growths, papillomatous in character, showed little or no change over a period of months. They were finally removed and microscopically were found to be malignant. There was a tendency in two of these cases to recurrence. Under small doses of iodid they eventually disappeared. There is no doubt that the microscope revealed the facts so far as possible. Morphologically, the specimens were malignant, but were of such low grade that the somatic resistance overcame the disease. When engaged in the field of general surgery years ago, I saw a melanotic sarcoma with metastasis in the axilla, neck and liver become absolutely inactive for a period of five years. The activity was then resumed in a fulminating form and the patient died in five weeks. In the four cases before mentioned, malignancy was probably present, which was proved to some degree by the fate of one of the patients. Seven years after all evidence of disease had faded from the larynx, the patient returned with a characteristic cancer on the old site. He refused operation, was treated by radium, and died of cancer.

Since there are several types of cancer affecting this anatomic field, the early manifestations must vary accordingly. As the disease advances, these early differences become less marked and the picture grows more uniform. The exact histologic nature of the disease has less clinical significance than the point of first attack. There is a wide difference in appearance between surface and deep cancers in their incipiency. Over 95 per cent of laryngeal cancers are squamous celled, and consequently surface growths. An uninterrupted and progressive and rapid growth is a marked feature of malignant disease to which there are a few exceptions. In one case, I watched an adenocarcinoma at the base of one cord for one and one-half years before its true nature became manifest. After a year of almost imperceptable growth, a deep seated sarcoma suddenly flared into an intense activity. Just what was taking place in these growths during this brooding period would be interesting to know. Were they malignant all this time, or were they in a precancerous or transitional stage? At some definite period in the life history of a cancer, there must be a moment when a cell or group of cells, apparently normal and apparently under the usual biologic control break their bonds and grow out of bounds. In this particular moment of time and in this minute laboratory, perhaps in one refractory cell alone, if we could but read it, is written the whole awful tragedy of cancer.

Extension may take place in any direction. In surface disease forward extension is perhaps the most usual. The anterior commissure may be reached and passed. At this point it is not unusual for the neoplasm to attack the cartilage, perforate it, and involve the pretracheal muscles and thyroid gland. In seven patients with moderately advanced and apparently intrinsic cancer, I have observed this issue. Perforation of the cartilage is rarely suspected before operation, and when discovered at operation it foreshadows a gloomy prospect. Hence in any case in which the anterior commissure is filled with cancerous growth, the operation should be so planned as to remove, with the larynx, a section of skin and all tissues lying on the anterior and lateral aspects of the larynx, including part of the thyroid gland. Two cases with involvement of the pretracheal muscles have gone beyond the three year limit without recurrence. Extension downward is frequently observed, and a large area of the subglottic lateral wall may be involved without being suspected. That this region should be overlooked is quite understandable, since the mirror or even the endoscope may give a view of only the upper margin of the growth. Hence the rule should be adopted that it is wise to add two-thirds to the visible portion of the growth in estimating its actual size. Endoscopy should, if possible, form part of the routine examination. By its use a better idea of the

extent of the growth in the larynx may be secured and the esophagus may be inspected. If involved, operation is a questionable procedure. Extension upward is fortunately more rare. In this direction the lethal boundary is soon reached and the cervical lymphatics are involved early. Backward extension is serious in proportion to its extent, the arytenoids being the danger line. It is a mooted point whether or not arytenoid involvement places the case in the extrinsic class. In the fulminating malignancies it assuredly does. But in the slow growing and less virulent types, some involvement of the arytenoid may exist, and yet the condition may be classified as intrinsic. Reasoning otherwise, we could not explain the complete recovery of such patients after laryngectomy. It is, however, the unanimous opinion that extensive involvement at this point is a most serious matter and affords but scant hope to the victim. Arytenoid disease predicates esophageal participation and, since the esophagus has an active lymphatic supply, deep cervical gland involvement. It is indeed distressing to palpate cervical glands when only moderate arytenoid disease is observed. Backward extension casts a grim shadow before and urges prompt and radical intervention. In arytenoid involvement, the esophageal wall in juxtaposition to the larynx should be removed with the larynx. In several subjects thus treated, no esophageal stricture occurred. Cervical adenitis is not always malignant, even when the characteristic hardness of that disease is present.

Outward extension or deep infiltration is more or less present in all cases. Its rapidity and extent are a fair index of the age and virulence of the disease. It is usually concomitant with extension in other directions, and may have a wide variation in time. Cancers of many months' duration may yet be superficial and spread over a wide surface or they may be small and circumscribed and deeply infiltrating. As will be shown in the text later, small circumscribed surface growths, having all the earmarks of incipiency, after laryngectomy on multiple section may show microscopic subsurface lines of extension into the anterior and posterior commissures. Mislead by this apparent benignity, inadequate procedures are often adopted. Since no human acumen can cope intelligently with a condition thus concealed, we may well doubt the wisdom of any other than the most radical surgical treatment. This specter is not raised to discourage or discredit conservative surgery, but rather to make comprehensible the reason why conservatism sometimes fails, in spite of the most favorable indications.

Eventually the infiltration reaches the musculature of the larynx causing fixation. This brings us to consider the second cardinal diagnostic symptom, cord immobility. Varying in degree and in time of onset, this symptom must eventually appear. If the disease has its

inception on or near the vocal cords ("the cancer area"), a slight loss of function may appear quite early; a marked degree is usually late. If its complete manifestation is demanded to clinch a diagnosis, our aid is in great danger of being too late, as wide surface extension may have driven the disease into the cervical lymphatics. Its earliest manifestations should be earnestly sought in all cases. Careful study may reveal a slight lagging of the affected cord long before complete fixation occurs. This slight change in mobility, taken with other suspicious evidences, should make the diagnosis positive. Malignant infiltration is the only pathologic condition in the larynx which causes unilateral muscular fixation. In syphilis and tuberculosis, if present, it is practically always bilateral. A certain sluggishness of movement may accompany any chronic inflammatory process, but it is invariably bilateral and due to a surface change in the mucosa, particularly in the arytenoid region. Here lagging is the expression of an ineffectual muscular contraction. In malignancy the muscles and their nerves become a part of the neoplasm and cease to exist. Hence the complete loss of muscular function.

Macroscopic palpable cervical gland involvement rarely occurs during the so-called intrinsic incipient stage, in which the neoplasm is confined to the "cancer area." When the disease starts on or near the so-called extrinsic line, lymphatic involvement may be early observed. Confusion sometimes arises from the presence of lymph nodes due to other causes such as diseased tonsils and infected teeth which keep active a low-grade lymphatic hyperplasia. The region of gland attack is the same for the tonsils and larynx, over and above the carotid bifurcation and along the anterior border of the sternomastoid. Tooth infection is more liable to affect the glands anterior to this region and in relation to the submaxillary gland. In thin necks, palpation may detect the hard shotty feel of malignancy. Even chronic inflammation in the larynx may give rise to a gland activity, thus more and more entangling the evidence. If doubt exists after a given time of observation and a painstaking search for other causes of gland reaction, the suspected gland or glands may be excised under local anesthesia and subjected to microscopic scrutiny. When ulceration occurs, evidences of a mixed infection may appear in the cervical glands combined with cancer, tuberculosis or syphilis, present in the larynx; or a mixed infection only may be present, simulating a malignant invasion. Microscopic and impalpable cervical gland involvement is beyond our clinical ken, and can only be suspected from the location, extent, character and activity of the disease under observation. The moment at which the lymph channels beyond the larynx have taken up the seeds of cancer, that moment the disease has become extrinsic and practically hopeless. That this transfer is some-

times late in the disease must be inferred from the surgical cures in which the whole larynx is filled to overflowing with cancer. That it is sometimes very early, is brought sadly home to us by our futile efforts in some apparently incipient cases. These positive evidences may be summarized as follows: A patient, aged between 40 and 60, may have gradually increasing hoarseness with no periods of remission. The appearance on one or other vocal cord, or elsewhere in the larynx, of a warty, single, sessile growth or of a localized bulging or thickening may be noted; there may be lagging of the cord on phonation. The steady progress in the growth may assume more and more the peculiar form, color and texture of malignancy; other diseases peculiar to the larynx being excluded, there may be shotty cervical lymph glands on the affected side; and lastly there may be the evidences from biopsy in either the original growth or in the cervical nodes.

It must be borne in mind that cancer does not limit itself to the cancer age. The youngest patients seen by me were aged 26 (two cases), the oldest was 80. Several between 30 and 40 and between 70 and 80 appeared.

The exclusion of other diseases peculiar to the larynx will now briefly be considered. Tomes have been written on this subject, consisting chiefly of words. This wordiness, ever a sign of mental confusion and futile effort to define that which in its nature baffles definition, is born of the great barrier which stands between conception and expression in the clinical teaching of medicine and surgery or of any subject in which both art and science are blended. Years of clinical study crowd the mind with complex pictures and memories inextricably interwoven and ever changing. They defy reproduction in words. Thus must we condone our own flounderings and those of others, in our efforts to seize and portray that shimmeringly elusive thing called experience.

Cancer must be differentiated from syphilis, tuberculosis, chronic laryngitis from all causes, benign neoplasms such as papilloma, fibroma, angioma, pachydermia laryngis, rhinoscleroma, prolapse or hernia of the ventricles, unilateral laryngeal paralysis, etc. To the trained eye many of these present no difficulty and, by their appearance and behavior, are easily recognized. It is not so, however, with syphilis and tuberculosis. The members of the triad (syphilis, tuberculosis and cancer) are constantly presenting themselves for identification and differentiation. As stated before, a positive Wassermann reaction is not to be taken as final evidence that the disease is specific. It must be backed by clinical and morphologic evidence. In syphilis, a chronic remittent or intermittent laryngitis may be present for a varying time prior to consultation. This may deepen into a complete and fixed hoarseness. Pain and discomfort, other than that caused by forced speech, are absent. Even in advanced laryngeal syphilis with tumor formation and ulceration, pain is rarely

complained of. Syphilis here, as in other locations, is an anesthetic disease. In tuberculosis, pain, discomfort and dysphagia are early symptoms. It is, therefore, a hyperesthetic disease. In cancer, pain is absent until later, when ulceration and secondary infection set in. Before this period an occasional patient may complain of a lancinating pain in the larynx on the affected side radiating to the ear. This presages a fair degree of advance and sufficient infiltration to reach the deeper sensory nerves. It never occurs in the incipient period. In the advanced stage of cancer, pain and dysphagia are always present but are less agonizing than in tuberculosis. Therefore, we observe that in the study of pain, cancer occupies a middle position between syphilis and tuberculosis and that pain radiation is peculiar to cancer at a fairly early period. Tenderness over the larynx may exist in tuberculosis. It is absent in the early stages of cancer and rarely present at any time in syphilis. A careful history is of paramount importance, and often brings out evidence which points to an attack of tuberculosis at some time in the patient's life. The patient's appearance may suggest a tubercular tendency or a latent infection. Increased pulse rate and a slight diurnal rise in temperature and loss of weight may add confirmation. A physical examination, in which the roentgen ray should take part, may reveal an active or latent lesion in the lungs.

Cough, absent in incipient cancer and not conspicuous in syphilis, frequently antedates laryngeal symptoms in tuberculosis. I have seen several exceptions to this in patients with latent or healed lung lesions. Here the characteristic cough of phthisis is absent and the larynx is the point to which the patient's notice is first directed. Hoarseness with discomfort on phonation, with pain and a mild dysphagia later, are the early symptoms. In cancer and syphilis, only the first of these may be evident. In tuberculosis, these three symptoms may remain fixed or may fluctuate, and as the disease advances they become more insistent. The local appearance of laryngeal tuberculosis is the visualization of the progressive phases in the life of the tubercle. These tubercles appear in the interarytenoid and arytenoid regions as pale, edematous swellings which coalesce, forming a pale, smooth, bilateral swelling. In conjunction with this and radiating from it is an inflammatory zone involving all or part of the interior of the larynx. No change in mobility of the cords is evident except that which must, of necessity, come from the thickening between them in the posterior commissure. Later, tumor formation and ulceration may bring the picture in closer parallel to cancer, but never at any time is unilateral partial or complete cord fixation observed; as a rule the disease has its greatest activity in the posterior part of the larynx. I have never seen cancer start in the interarytenoid space, its favorite point of inception being the middle or

anterior third of one or other cord. In tuberculosis the peculiar characteristics of inflammation at all times overshadow those of tumor. A pale watery edema, not seen in cancer or syphilis, is commonly present, especially in the arytenoids.

The foregoing is the picture in the average case, yet an impasse is sometimes reached in which the evidence for or against tuberculosis must be looked for outside the larynx. The opinion of a lung specialist must then be sought. Since this opinion is of vital importance to the patient, the examination must be painstaking and thorough. No casual stethoscope examination now has any value. A meticulous history, roentgenographic study, and temperature and pulse observations over several days and under varying conditions must be added. Syphilis may appear as a persistent and intractable chronic laryngitis, with perhaps more thickening of the mucosa than that observed in a simple chronic inflammation. It may again appear as a gumma which may go on to rapid and extensive ulceration. Such a patient recently came to me for a laryngectomy. There was no history of syphilis and the Wassermann reaction was negative. The case history showed that the condition had been present only for ten weeks. Such extensive destruction of tissue in so short a period is not characteristic of cancer. On antispecific treatment, the larynx healed in one month. The gumma occurs in the deeper structures and resembles more the rarer type of malignancy—adenocarcinoma and sarcoma—which forms only 4 per cent of all cases. The generalized inflammation which accompanies gumma does not occur in incipient cancer. It is well to remember that negative blood or spinal fluid Wassermann reactions do not always exclude syphilis.

Combinations of one or all of this pathologic triad may occur in the same larynx, to still further confuse the diagnosis. Syphilis and cancer are often associated, the former setting the stage for the latter, which comes as a secondary implantation on an already irritated field. In one instance, I verified the presence of syphilis, cancer and tuberculosis in the same larynx. Active tuberculosis and cancer must be rare. Cancer, however, may attack a larynx formerly the seat of tuberculosis, just as gastric cancer may appear on the site of a healed peptic ulcer. In one such case observed, the cancer started at the edge of a tuberculous cicatrix and in contact with one arytenoid. The therapeutic test for syphilis is of considerable value here.

In the syphilitic patient, it is a common observation that under antispecific treatment a malignant growth may shrink to a certain point only to resume again its progressive course. This resumption of activity after a rest or retrogressive period should convince the observer that he is not dealing with syphilis alone. Many lives have been lost by not realizing this truth.

Laryngeal tuberculoma at first may be confusing. Like cancer, it is usually located on one or other cord and resembles a papilloma. However, it always has a sessile inflamed base. I have seen it only in young adults. A careful examination of the lungs in the patients seen yielded evidence of active or quiescent tuberculosis. Its progress is slow and improvement may be observed on vocal rest.

ETIOLOGY

Of this, little is known. Clinically, to me, cancer strongly suggests a low-grade infection paralleling in many respects the infectious granulomas, syphilis, tuberculosis and leprosy. It may well be that cancer is a constitutional infection or condition, its local manifestations being determined by some continuously applied irritation. It is interesting to observe how frequently chronic infections above the larynx—foul mouths, especially from pyorrheal teeth, infected tonsils and lingual tonsils and sinusitis—are present in cancer of the larynx. A severe type of pyorrhea is often associated with cancer of the mouth, throat, larynx and esophagus. I have long felt that its significance is not sufficiently emphasized and would invite further observation on this point. The presence in the larynx of one or other of the chronic infections or benign neoplasms may long antedate the onset of cancer. The transmutation of the tissue cell from benign to malignant is to me at least established clinically, notwithstanding the academic arguments to the contrary.

The following clinical observations are significant in their bearing on the constitutional nature of cancer. The more malignant and active the disease, the less resistant is the patient to operative shock. Cancer arrested in one situation may appear years later in another quite unrelated situation. When the disease appears in a hitherto normal area, free from chronic irritation, it has seemed to me to show a more malignant tendency than when it is superimposed on an area long the site of chronic irritation or benign neoplasm. Its more malignant behavior in a normal field might indicate a greater constitutional charge of the virus or ferment or poison of cancer. The appearance of cancer in two or more unrelated persons, living in close contact with one another, is hard to explain on grounds other than infection. Malignant disease may become spontaneously arrested for months or years or may entirely disappear. In this article, I have mentioned a metastatic melanotic sarcoma that was arrested for five years. These clinical observations must be elucidated before the constitutional theory of cancer can be negated.

Malignant disease of the larynx forms from 2 to 3 per cent of all malignant tumors, and 16 per cent of all laryngeal tumors; in nature it

is squamous celled and is highly malignant in 95 per cent. The remaining 5 per cent is made up of basal celled carcinoma, adenocarcinoma, malignant papilloma, spinal celled carcinoma and sarcoma.

ANALYSIS OF PERSONAL CASES

Since 1908, more than 383 cases of laryngeal cancer have come under observation. Of these, 130 patients have undergone surgical treatment as follows: Thyrotomy, twenty-two; hemilaryngectomy, six and total laryngectomy, 102.

OPERATIVE MORTALITY

The surgical deaths were as follows: No deaths followed thyrotomy or hemilaryngectomy. In 1916 to 1917, two died, one five days after operation of septic bronchopneumonia, and the other, three weeks after operation of general sepsis. Both had diabetes. Between 1917 and 1924, fifty-five total laryngectomies and four thyrotomies were accomplished without a mortality. In 1924, one death occurred three weeks after operation from thrombosis of one cerebral artery. The wound was practically healed. This patient had syphilis and diabetes. Under careful metabolic treatment combined with insulin, we succeeded in healing the wound. The necropsy showed extensive syphilitic changes in the aorta, and infarcts of varying ages in all the organs. In 1925, a diabetic patient died in the eighth week of convalescence. One week after the operation, he became insane. Dr. Foster Kennedy, neurologist, at the beginning made the astute diagnosis of an actual brain lesion. At the time of death, the wound was healed except for a small fistula. During the postoperative period, the temperature at no time was normal, yet the general condition was excellent. Toward the end, the temperature rose and signs of a gross intercranial lesion became manifest, ending in the classical picture of meningitis. No necropsy was performed. This patient had an old cardiac and aortic lesion. My understanding of the sequence of events is as follows: Diabetes with low resistance, old cardiovascular lesion; at or shortly after the time of operation a septic embolus, either from the cardiac lesion or from the operated field, entered the brain. This gradually gained momentum and eventuated in local softening or in abscess. It is noteworthy that these four patients suffered from diabetes.

RECURRENCES

Eighteen thyrotomies were performed prior to 1917. Fourteen patients died within two years of recurrence. Four thyrotomies were performed between 1917 and 1924, with one recurrence seven years after operation. Many of the early cases were, in the light of present

experience, entirely unsuited for any operation short of total laryngectomy. Six hemilaryngectomies performed prior to 1917 resulted in four recurrences. Prior to 1917, thirteen laryngectomies resulted in six arrests and in two surgical deaths. Between 1917 and 1922, thirty-one laryngectomies gave five recurrences. In twenty-four, traced after the three year limit, the disease has been arrested. The two untraced were incipient, and have probably come through without recurrence. From 1922 to February, 1926, fifty-eight laryngectomies show five recurrences. Five patients operated on during the last year were in the advanced intrinsic stage, and they probably will die of recurrence.

EXTENT AND LOCATION OF LESION

Class 1.—Incipient, unilateral, arytenoids and anterior commissure free. Sixty-three cases. Sixty were traced, of which two were recurrences.

Class 2.—Bilateral, anterior commissure involved, posterior part of larynx free, moderately extensive. Thirteen cases. Eleven were traced, there were two recurrences.

Class 3.—Unilateral, anterior commissure and part of arytenoid involved. Ten cases. Eight were traced; there were three recurrences.

Class 4.—Primary on area between arytenoid and pyriform fossa, incipient. One case, with one recurrence.

Class 5.—Primary in pyriform fossa, one case, with one recurrence.

Class 6.—Disease extensive in anterior commissure, perforation of cartilage beginning involvement of pretracheal area. Seven cases. There were two recurrences.

Class 7.—Extensive bilateral involvement, the larynx was filled with cancer. Seven cases. There were three survivors with four recurrences after ten, six and three years.

One sarcoma occurred in this series. This patient is free from recurrence after five years. One patient, operated on in his eightieth year, died of pneumonia at the age of eighty-four. One died of cerebral hemorrhage two years after operation, and one of nephritis one year after operation. Four others have died after the three year limit of diseases not related to cancer, so far as I can determine.

In 94 per cent, the type of malignancy was squamous celled carcinoma. The remaining 5 per cent was made up of epitheliomas, adenocarcinomas and one sarcoma.

(*To be Continued*)

THE DEVELOPMENT OF THE MEMBRANOUS LABYRINTH

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One of the difficulties in preparing sections for microscopic study of the internal ear is to secure sections which will present relations in a way that they can readily be understood. The labyrinth of the ear from the domestic pig is particularly suitable for making such preparations, because in the embryo as well as in the new-born pig, the labyrinth with its capsule can, with little difficulty, be separated from the surrounding structures. Such a labyrinth, when embedded in celloidin, can with care be cut in any plane desired, bringing out the several relations to best advantage for study. The labyrinth with its cartilaginous capsule in this way can be prepared even in quite small embryos. I have found that for a young embryo the best way to secure the labyrinth preparation is, first by removing the skull cap and the brain, and allowing the tissues to become fixed by immersion in Mueller's solution for several weeks, then, without attempting to seize the easily compressible labyrinth, the surrounding tissue can be removed by means of small tissue forceps, one held in each hand. By working in this way, I was able to secure a series of preparations showing the several steps in the development of the internal ear from an embryo 3.5 cm. long up to the full term fetus.

FIRST PREPARATION

The first preparation is from a pig 3.5 cm. long. The section is horizontal, passing through the cochlea and vestibule and the posterior part of the capsule which contains the semicircular canals. The preparation contains the stapes, and it will be noted that the footplate as well as the crurae are derived from the cartilage which forms the capsule of the labyrinth, while the head of the stapes appears to be a quite separate structure. In this preparation the cartilage forming the anterior part of the stapes is still directly continuous with that of the capsule, whereas the posterior border of the stapes has already separated from this capsular cartilage through the formation of connective tissue. Just to the right of the head of the stapes is shown a cross section of a bundle of nerve fibers, the facial nerve. Lying in front of the stapes and approximately at the apex of the cochlea is a cross section of a rather large blood vessel. The cavity which is to form the vestibule is found completely filled with connective tissue stroma. As yet, there is no free open perilymphatic space. Lying within this connective tissue stroma of the vestibular cavity are two open spaces, each lined with epithelium.

These are sections through the utricle and saccule, the one anterior and nearest to the cochlea being the saccule, the utricle lying posterior. The thickening of the lining epithelial layer shows in places indicating the location of the maculae acusticae. Nothing appears to indicate the beginnings of an otolith membrane. This structure develops much later.

In the posterior part of the preparation, that to the right in figure 1, are shown cross sections of two membranous semicircular canals. The one lying above and nearest the stapes is the horizontal canal; the one below is the posterior canal. These membranous canals lie completely surrounded by cartilage. There is shown, however, a distinct change in the density of the cartilage immediately around the canals in which a change in connective tissue is taking place. From this space the perilymphatic channel of the semicircular canal eventually develops.

In the anterior part of the preparation, that to the left in the illustration, one recognizes the outlines of the cochlea with cross sections of the ductus cochlearis as far as this tube has been developed, that is, for approximately two coils. Immediately surrounding the membranous cochlea is shown the transformation of cartilage into connective tissue, but at no point do there appear open spaces in this connective tissue reticulum for the perilymphatic channels, the scala tympani and the scala vestibuli. The thickening of the epithelium from which the organ of Corti is formed can easily be recognized. In the cross section of the ductus cochlearis in the basal coil, one can readily recognize the beginnings of the membrana tectoria.

SECOND PREPARATION

Figure 2 shows a marked advance over that from the 3.5 cm. embryo. The cartilage forming the stapes is now completely separated from that of the labyrinth capsule. The niche of the oval window is still completely filled with a reticulum of connective tissue. The concentration of this reticulum and its formation into the ligament of attachment for the footplate of the stapes can be distinctly recognized. The large open space in this preparation lying to the left of the stapes is the canal for the facial nerve, from which the bundle of nerve fibers has fallen out. Within the cavity of the vestibule one sees just beneath the footplate of the stapes an opening in the connective tissue reticulum. This is the beginning of the perilymphatic vestibule. Along the margins of this opening, we fail to recognize an accumulation of connective tissue nuclei described by Streeter. This section passes again directly through the saccule and the utricle, and the thickening of the lining epithelium in which the macula acustica is forming is more sharply defined. The location of the two maculae in planes at right angles to each other is present in the early embryos. The cartilage immediately

PLATE 1

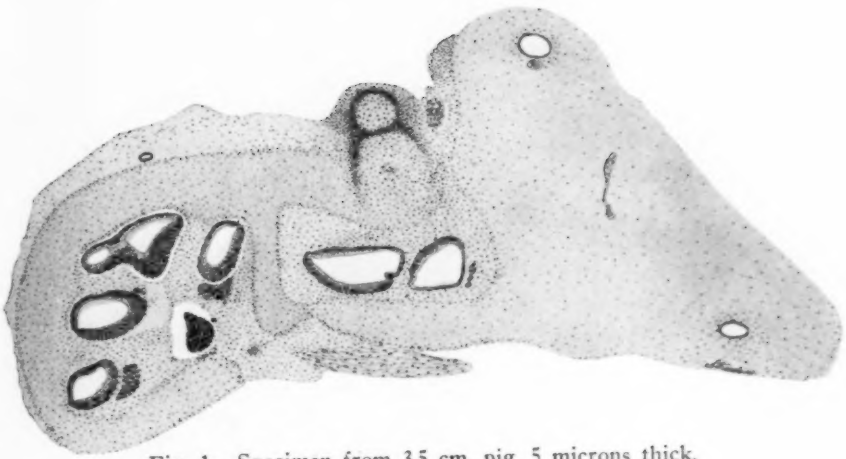

Fig. 1.—Specimen from 3.5 cm. pig, 5 microns thick.

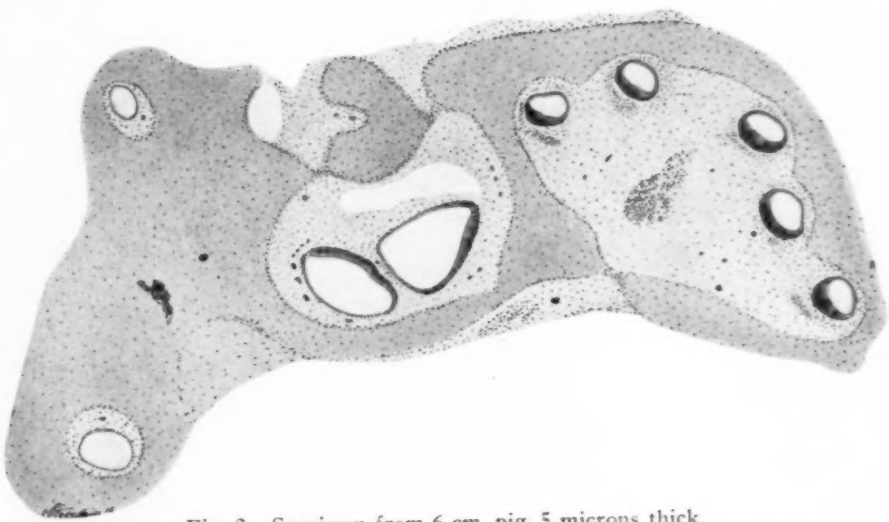

Fig. 2.—Specimen from 6 cm. pig, 5 microns thick.

PLATE 2

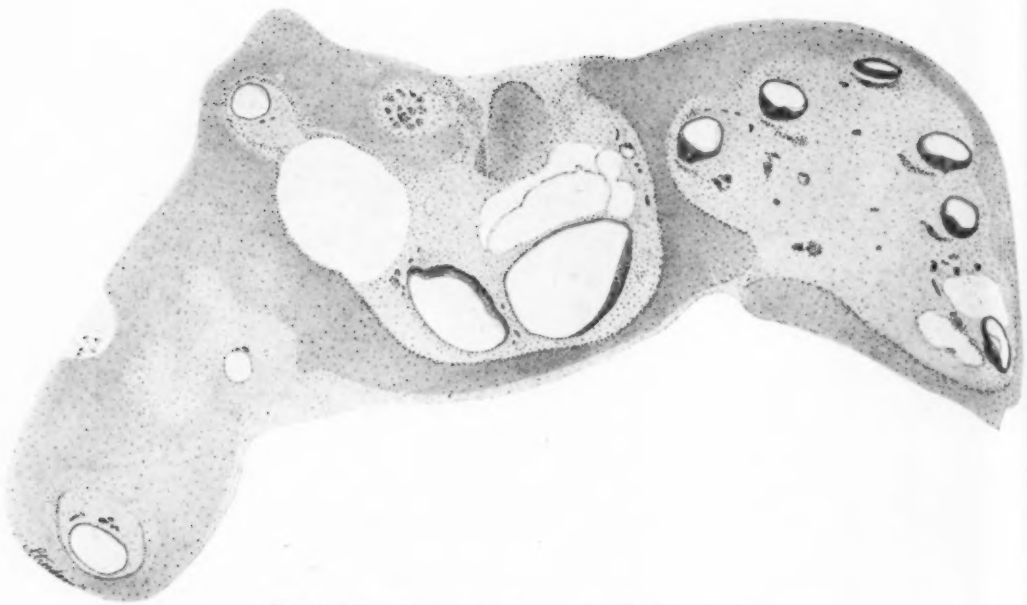

Fig. 3.—Specimen from 8 cm. pig, 5 microns thick.

PLATE 3

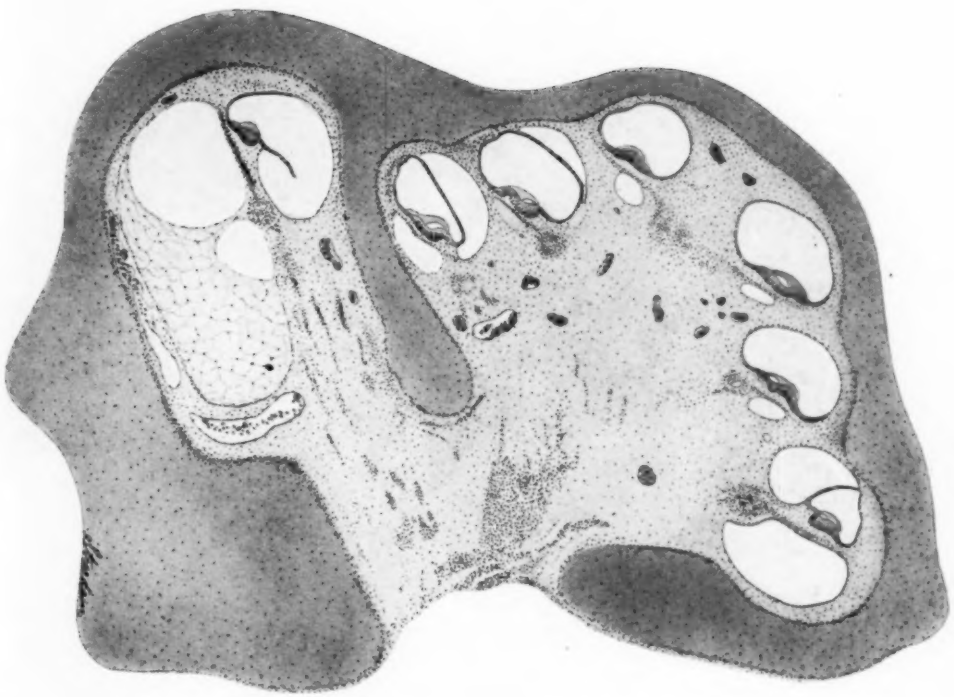

Fig. 4.—Specimen from 15 cm. pig, 5 microns thick.

Fig. 5.—Specimen from full term fetus, adult stage, 10 microns thick.

surrounding the membranous semicircular canals had disappeared, and in its place is left a reticulum of connective tissue out of which the perilymphatic space is later to be formed.

The section passes directly through the center of the modiolus of the cochlea, making cross sections of the ductus cochlearis in its two and one-half coils. The ductus cochlearis is still surrounded by connective tissue stroma, in which no openings have as yet appeared for a scala tympani or scala vestibuli. On the floor of the ductus cochlearis in each section of the tube the thickening of epithelium for the formation of Corti's organ is seen, and at the inner angle of this epithelial thickening one finds the beginnings of the membrana tectoria.

THIRD PREPARATION

In figure 3, the section again passes through the niche of the oval window, in which we recognize the cartilage forming the stapes. The section fails to show the attachment of the footplate as in the previous preparation. The cross section of the facial canal with the bundle of fibers of the facial nerve is recognized as before, lying between the niche of the oval window and horizontal canal. The formation of the perilymphatic space of the vestibule in the connective tissue reticulum filling the vestibular cavity is now well under way. The cells forming this reticulum are clearly disappearing by dissolution. There is no evidence that they are being pushed off to the margins to persist as an endosteal lining of the vestibular cavity. This endosteum is formed from the connective tissue cells in the immediate neighborhood which do not disappear. Note again the thickening of the epithelium in the saccule and utricle for the formation of the maculae, and the plane of these two end-organs lying at right angles to each other. As yet, no signs of an otolith membrane is seen.

This section, similar to the previous ones, passes again through the horizontal semicircular canal in the upper left hand corner of the illustration, and the posterior canal below. The absorption of cartilage surrounding the membranous canal has still further advanced, and it will be noted that this absorption is much more extensive on one side of the canal than on the other. In the adult, the side along which the membranous canal will be attached to the osseous capsule is thus clearly indicated. At no place has the open space for perilymph formed. The cartilage between the canals has begun to undergo changes preparatory to its transformation into bone. The first stage of this transformation is the change from cartilage into connective tissue.

This section is again made to pass directly through the middle of the modiolus of the cochlea, and shows a cross section of the ductus cochlearis in the two and one-half coils. The piling up of epithelium in the

floor of each section of the ductus cochlearis for the formation of Corti's organ is more distinctly defined, and the membrana tectoria is now easily recognized throughout the entire cochlea. In the basal coil, at the lower right hand corner of figure 3, the absorption of the connective tissue reticulum surrounding the ductus cochlearis is well started. One recognizes the beginning of a scala vestibuli above and of a scala tympani below. The upper wall of the ductus cochlearis goes to form the membrane of Reissner. The absorption of connective tissue for the formation of the scala tympani is not advanced far enough to form a recognizable membrana basilaris.

FOURTH PREPARATION

In figure 4, one now begins to recognize the cross section of the cochlea as known in the adult state. Throughout the basal coil and the beginning of the second coil we find a well defined scala tympani and scala vestibuli, the perilymphatic channels of the cochlea. In the beginning of the basal coil the rather extensive space which goes to form the scala tympani, characteristic of the cochlea of the pig, has only partly cleared of its connective tissue reticulum. In the spaces still occupied by this reticulum of connective tissue, wide open spaces preliminary to its complete disappearance are shown. The reticulum is absorbed as in the formation of the perilymphatic spaces of the vestibule and is not pushed aside to form the endosteum. Reissner's membrane in the posterior section has been torn loose from its attachment to the spiral ligament. The epithelium along the outer wall of the ductus cochlearis, which later forms the stria vascularis, has begun to thicken. In the upper coils of the cochlea the scala vestibuli has not begun to appear, but a space for the scala tympani has formed even up to the apex of the cochlea. Note the changes in the epithelial thickening forming Corti's organ; also the development of a substantial membrana tectoria. The development of the scala tympani throughout the basal coil has progressed far enough to permit the formation of the structure which is later recognized as the membrana basilaris, and in all but the apical coil the formation of the spiral ganglion is also well advanced.

FIFTH PREPARATION

In figure 5, this section passes directly through the center of the modiolus, cutting the ductus cochlearis in each of the two and one-half coils in a manner which shows Corti's organ to best advantage, that is, parallel to the pillars of Corti. The cartilage of the capsule has completely changed into bone, and there is a mechanism fully developed and apparently ready to receive impressions from the impulses of sound waves. It seems probable, therefore, that a new-born pig is capable of hearing.

MALINGERING DEAFNESS

TESTS IN ITS DETECTION AND REPORT OF TWO CASES*

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Pretended deafness often is difficult to detect. This condition commonly arises after injuries, the complaint of deafness and vertigo persisting long after all other signs of the accident have disappeared. If these patients are seen at an early date, malingering can readily be detected by the various tests at our disposal. Often after an accident the malingerer will exaggerate preexisting ear trouble without any physical basis for complaint. If the examination is made soon enough, a traumatic drum rupture can be ascertained easily.

The success in detecting deafness malingering depends on:

1. How soon after an accident the symptoms were complained of.
2. The symptoms (unconsciousness, vertigo, vomiting).
3. When the symptoms were noted by a physician.
4. By the variation in the patient's story.

Deafness of long duration can be recognized easily from the tone of the voice. These sufferers usually have the characteristic monotone of the deaf, which is present only in the advanced and in genuine cases. If only one ear is affected and the voice is unchanged, a man who wishes to hear will naturally and involuntarily turn his head in the direction of the speaker. In testing such cases, the fact should be kept in mind that riveters, ironworkers and boilermakers are, from the nature of their occupation, partially deaf.

In examining these patients, we must take into account also the fact that a malingerer tries to make his deafness very apparent and will repeat words in an uncertain manner. It will also be found that his hearing distance will vary at different examinations, and if asked to repeat a two numeral letter aloud and then at a lower tone at the same time using proper lip movement, he will pretend not to hear it.

Malingerers rarely claim double deafness. When double deafness is simulated, it is more difficult to detect. Such subjects should be placed in a hospital under observation, until with kind treatment, proper tests and constant repetition, the malingerer will finally give in. In bilateral deafness, Boissein makes insulting remarks about the patient

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in his presence, as well as that of his nurse or assistant. In this way the patient will sometimes betray himself by flushing or changing expression, which indicates existence of auditory perception.

HEARING TESTS

The hearing tests usually employed in these cases will undoubtedly detect the malingerer. These are divided into those that test nerve deafness, labyrinth deafness and air-conduction deafness. Those most commonly used are the voice test, electric, caloric, rotation, tuning forks and various other means at our disposal. One ear should be tested while the other is closed tightly by the patient's finger. Sometimes it is impossible to state whether certain tests are heard in the deaf or in the good ear, and to obviate this mistake, Bárány's noise apparatus is valuable when used in the good ear. By its noise, this instrument occupies the attention of the ear in which it is used, so that any words spoken or shouted into the bad ear have been heard by that ear if they are repeated by the patient.

The voice tests for malingerers are several in number. Callahan's [1] test is based on the fact that stimuli which are similar in all properties except intensity are not dissociated by the mind. He claims that only the stimulus which is of greater intensity is registered in the brain so that we are conscious of it. We are conscious of hearing a sound only in the ear that receives the most intense vibration. The apparatus used in this test consists of rubber tubing with couplings permitting the addition of sections and a mouth piece. With equal sized tubing, the whispered or spoken voice is heard in both ears. With unequal lengths, however, the patient is conscious of hearing the voice in the ear that is connected with the short tube, which is within hearing distance. If a patient is really deaf in one ear, he will admit hearing through the tube, as the tube going to the good ear is always within the hearing limits of the good ear. But when he hears in the supposedly deaf ear he will deny hearing anything. In this way he is easily detected.

If a speaking tube is placed in each ear of the subject, and two people speak, one into each tube on different subjects and different rates, if he hears in both ears he will confuse the voices and be unable to understand either of the people talking. If he is able to hear and follow, it indicates that he really is deaf on one side.

The watch test, as described by Erhard, depends on the principal that if the external auditory canal is tightly packed, it will still conduct sound to a limited extent. A loud ticking watch should be heard at a distance of 2 or 3 inches. The patient is placed in the middle of a large room and the alleged deaf ear is plugged. A loud ticking watch is gradually

1. Callahan, J. T.: Boston M. & S. J. **179**:423 (Sept. 26) 1918.

brought toward this ear and the patient is ordered to count the beats. The same procedure is carried out with the good ear. If he says he does not hear the watch tick at from 1 to 2 inches, malingering is suspected.

The electric test, as described by R. R. Brownfield,[2] consists of a 110 volt alternating lighting current, which by means of a potentiometer produces a variable current. The patient is told to indicate the point at which he can or cannot perceive the vibrations and these are charted. After several trials the various readings are found to harmonize quite closely. In the malingerer, however, the inconsistency of the readings lead readily to detection.

Lombard's test depends on the fact that a normal person depends on the sound of his voice for the proper regulation of its tone and intensity. If a man is given a book and told to read in his natural voice and a Bárány noise apparatus is placed in his good ear, he will raise his voice if deaf, and literally shout if profoundly deaf. The malingerer, on the other hand, claiming a one-sided deafness which is not real will continue to read in an even tone or in one very slightly elevated.

Another voice test consists in the patient closing his good ear with his finger. The examiner now repeats words and numerals at first at a low voice and then in a progressively louder and louder tone. If when the pitch is reached when the patient should hear with the good ear, even when tightly occluded, he still states he cannot hear, we conclude he is a malingerer.

The stethoscope test for unilateral deafness is not very accurate, as sound will travel along the rubber tubing. One of the tubes of a stethoscope is plugged. The closed end of the tube is placed into the good ear and the open end of the tube into the alleged deaf ear. Then the patient is directed to repeat the words spoken into the bell of the stethoscope. Then the stethoscope is removed, the good ear is plugged tightly and the procedure is repeated. If he now says he cannot repeat the words he heard before, with the ear piece plugged up closing up his normal ear, he is malingering.

The tuning fork tests are applied in the usual way, except that the malingerer's eyes are closed. A good ear cannot be shut off from sound by plugging the canal with cotton or with the finger. The Bárány noise apparatus is employed to deafen the ear temporarily. If the good ear is thus temporarily deafened and the patient can still hear, we can easily trap him. If the hearing has been lost in the right ear, a tuning fork placed on top of the skull should be heard on the left side. If the suspected malingerer is now told to place his finger in his left or good

2. Brownfield, R. R.: Detection of Pretended Loss of Hearing, J. A. M. A. **70**:597 (March 2) 1918.

ear, he should hear the tuning fork in that ear even louder than before. The malingerer, however, will probably say he does not hear it at all, in which case, of course, the fraud is detected.

In any partially deaf person the hearing for the lower tone limit by air conduction is raised, so that if he does not hear the "C" fork by air conduction he has middle ear deafness. Now, if a "C" fork is placed on the midline of the skull and the vibration is heard best in the partially deaf ear, then we are certain of the diagnosis of middle ear deafness. The malingerer, however, will not admit this, and will deny he heard it. We must keep in mind that in labyrinthine diseases the C2 fork is heard better in the good ear.

REPORT OF CASE

CASE 1.—F. G., aged 29, a laborer, whose previous history was negative, denied having any ear, nose or throat ailment. The present history dates back to May, 1925, when the patient fell off a high ladder and was removed to the Beth Moses Hospital. When he recovered consciousness, he noticed bleeding from the right ear, the nose and the mouth. A diagnosis of fracture of the base of the skull was made, but the roentgen-ray findings were negative. Examination of the drum of the right ear showed an oval perforation at the lower central area, with a scant serous discharge. There were several small blood clots still present in the ear canal. The hearing tests were practically normal. The patient was kept in bed and no treatment was given to the affected ear. At the end of two weeks, the perforation healed and the serous discharge ceased. At this time the patient complained of headache, dizziness and inability to hear well with the right ear. This condition continued, until at the end of six weeks practically all symptoms had disappeared except apparent deafness. Examination now showed a normal drum with normal light reflex. Applying the tuning forks with eyes closed, he stated he could not hear both A. C. and B. C. at the right (bad) ear but could hear them well at the left (good) ear. He was now told to close the good ear with his finger, and on application of the tuning forks he stated he did not hear them at all. As a matter of fact he should have heard them still louder, so it could be seen that he was malingering. I next applied the voice test, by placing a tube to which was attached a funnel, making a crude speaking tube into each ear. My assistant then spoke into one tube, while I did likewise into the other, with the result that he could not understand either of us. This was conclusive evidence that he could hear in both ears, confusing both our voices. If he was really deaf in the right ear, he could have heard and understood what was said to him in the normal left ear. Callahan's test was likewise carried out, and the patient told he could hear in the deaf ear. When the man discovered he was trapped, marked improvement in his hearing was noted and at the present time he hears normally.

CASE 2.—J. J., aged 20, a mechanic's helper, on March 27, 1925, was struck by a valve lifter on left side of head and claimed that he was unconscious for two hours. A roentgenogram taken at St. John's Hospital the same day was negative. At examination, on April 15, he claimed he was deaf in the left ear as a result of the accident; at the same time he complained of a profuse discharge from the left ear, marked headache, dizziness and nasal discharge. Examination of the left ear showed a large perforation at the lower central part, which was discharging a profuse foul and yellowish pus. There was no mastoid tenderness present. Granulation tissue could be seen in the middle ear through the opening in the drum. The right ear was normal; the septum was markedly deviated toward the left. The left nostril was filled

with pus, which seemed to come from the middle meatus. The tonsils had been removed several years prior to this. By applying the various tests, only a slight loss of hearing was indicated. The tuning fork tests were heard better on the diseased side when placed while vibrating on the median line of the skull (Weber's test). This proves conclusively that the patient was suffering from purulent otitis media with slightly diminished hearing, which he was exaggerating and trying to attribute to the accident.

CONCLUSION

In conclusion, no one should be called a malingerer unless the responses to the various tests are conclusive of fraud or exaggeration, and then an opinion formed should be supported by sufficient evidence. The mere rupture of the drum does not necessarily mean appreciably diminished hearing. According to Kopetzky and Schwartz,[3] the fact that the vestibular reactions are normal in a totally deaf ear does not necessarily mean that the person is a malingerer. These investigators state that complete deafness may occur without involvement of the static labyrinth.

44 West Seventy-Fourth Street.

3. Kopetzky, S. J., and Schwartz, A. A.: Laryngoscope **33**:340 (May) 1923.

A NEW METHOD FOR TESTING HEARING

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The hearing tests are the ways and means we possess in our otologic practice for determining the quality and degree of impaired hearing function. They are of the greatest service in helping to localize a pathologic process when other objective symptoms fail; they are also the most dependable guide concerning the efficacy of our therapeutic endeavor.

Otologists, in general (accepting the diffusion theory of sound by Mach—Wienn), believe that the lateralization of the tuning fork sound from the median line points of the patient's skull is due to the difficulty encountered by the sound in its attempt to escape to the outside, via an auditory canal obstructed by cerumen, furuncles, exostosis, etc., or through a pathologically changed middle ear and drum membrane.

We, on the other hand, believe with many others that the lateralization is due first, to an increase in the mass proper of the skull on that particular side, and second, not to the obstruction set up by the mentioned pathology in the pathway of the escaping sound, but rather to the difficulty met by the sounds in their attempt to penetrate into the ear. In this way, the acoustic nerve of the affected side will perceive more of the sound naturally found within the head than does its associate on the opposite end of the skull.

This is adequately shown by the fact that head noises (tinnitus) are on the increase in a quiet room, and that tuning forks are heard better in the back than in the front offices on account of the interfering street noises. Patients afflicted with tinnitus frequently state that it completely disappears when they find themselves in a noisy place and reappears in a quiet room.

There is a sound constantly present within the human skull, possibly due to central pulsation, or to the motion of the blood stream in the large blood vessels, such as the sinuses, etc. These sounds are constantly transmitted to our hearing centers, but, because of the noises coming in from outside the skull, remain masked and are not perceived. However, as soon as the ears are blocked by the insertion of the finger tips, we immediately notice noises, indefinite as they may be.

By comparing the bone conduction of both halves of the skull from the middle line points, we are trying to localize the hearing perception (Weber); by comparing the air and bone conduction of the same ear

we differentiate between conductive and perceptive lesions (Rinne); and by comparing the bone conduction (assumed normal) of the examiner with that of the examined, we elicit the perceptive ability of the acoustic nerve (Schwabach).

The end-result of these tests depends on what information we get from the patient, without in the least being able to control or to contradict his or her statements, as would be the case in testing the vision or the sense of smell.

This fact in itself, is proof enough how faulty and unreliable our deductions might be, and in all probability are, at times; besides, each test has its inherent shortcomings which impair, to a certain degree, their usefulness and lead to false interpretations.

To arrive, therefore, at a correct diagnosis we must take into consideration the etiologic factor, the course and progress of the disease, in addition to all the instrumental and vocal hearing tests. For this reason many investigators have searched for an improved method, based on a more scientific foundation and for a more simplified clinical technic.

An apparent step forward in this direction seems to us the evolution of a new test by Drs. Goldberger and Schoen of Vienna, and named by them "skull phonendoscopy." It is based on the resonating properties of the bone and of the cavities (sinuses) of the head. While this test is not new in the otologic field, it was never given any consideration either in normal or in pathologic cases.

Politzer, Lucae, Bezold and many others have noticed that when a vibrating fork is placed on the skull outside the median line, the resulting sound waves spread over the entire surface of the head, but they concentrate and are perceived louder in the ear farthest from the fork than in the ear nearest.

This phenomenon of sound obliquity is not a mere accident, but a constant, normal, physiologic fact to be explained by the skull resonance, according to these authors.

It is a well known law of physics that when a body free to vibrate (say, the skull) is subjected to the action of another periodic force (a tuning fork), the first is compelled to surrender its natural mode and rate of vibration and adopt those imposed on it by the external periodic force, which resulting motion will last as long as the periodic force continues.

RESONANCE

A co-vibration of both takes place when their periods of vibration coincide; this is called resonance. In other words, the vibrating body (skull) is absorbing energy in the form of vibrations from the periodic pulses of the external force (fork) and soon vibrates with large amplitude. Therefore, by placing a vibrating tuning fork on the skull, we

compel the latter to surrender its natural vibrations and force on it those of the fork. We get co-vibration (resonance) or a reinforcement of the sounds emitted by the fork only when we use those of low pitch (from 128 to 256 double vibrations), which coincide with the natural low vibrations of the skull.

It is, consequently, self-evident that the present conception of "bone conduction" is meaningless; unless we confine it to the physical property of transmission, in a way similar to other mediums such as air, water, metal, etc.

BONE CONDUCTION

If this notion be correct, the following deductions are to be derived from it:

1. The more compact the consistency of the bone, the better the transmission of the sound wave.

2. Only pathologic changes in the structure proper of the bone—discounting the physiologic variations of age—will interfere with the sound transmission, quite immaterial what the actual condition of the ear may be at the time.

3. The pathology of the ear has nothing to do with the texture of its covering bone, except in sclerosing chronic mastoiditis; so when we say shortened bone conduction equals nerve impairment, the bone per se may not be at all diseased, or, vice versa, the underlying nerve may be absolutely normal.

We are thus led to the conclusion that whenever we test the bone conduction by placing the fork on the skull, we unconsciously and unintentionally test the resonance instead; the ear acting as the executive organ for the perception of that reinforced sound.

The resonance varies with the quantity and quality of the vibrating mass and with the amount of air contained in the mouth, larynx, accessory sinuses, and nasal passages. The slightest changes in these elemental factors reflect themselves in a modified resonance, a valuable asset for detecting pathologic changes.

A vibrating fork placed in the middle points of the skull will divide the same into two equally strong and equally long resonating masses, but when it is outside of the middle line we instantly divide the skull in two unequal halves, one proximal and the other distal, from the contact point of fork and bone.

The smaller (proximal) vibrating mass will stimulate with a weaker resonance the nearer ear, while the larger (distal) and stronger resonating portion of the skull will stimulate the farther or opposite ear. This fact explains what we call the "diagonal resonance." Ultimately, this resonance is perceived by the nerve apparatus of either one or of both ears, and this perception faculty can be exactly measured and

recorded in units of time. By the concrete application of this principle, we submit the subjective data of the patient to an efficient control by the examiner and thus enhance the reliability of the hearing test.

To accomplish this we connect our ears or, to be exact, our skull with that of the patient (sitting in front of him) by means of two (half a meter long) diagnostic tubes. A vibrating fork of low pitch (from 128 to 256 double vibrations) is then placed on any point in the median line of the patient's skull and we listen in. If both have normal hearing the fading of the fork will be noticed in exactly the same time, the examiner possibly hearing it a little longer, and each of them will localize the sound in the head (equally in both ears). The fork is then brought in contact with a point outside the median line (with the protuberance of the parietal bone); the patient will perceive the sound on the opposite ear—diagonal resonance—and it will be heard by the examiner in his corresponding ear. All points outside the median line cause an oblique resonance.

The hearing perception and its duration is tested by placing the fork on the examiner's head, and by counting in seconds how long it is heard by both patient and examiner, the latter being supposed to have normal hearing. By alternately compressing and releasing the rubber tube, the better hearing ear is located, and by asking the patient to localize the examiner's vibrating fork with his eyes closed, the patient's intelligence and veracity can be checked up.

Any increase in the vibrating mass of one side, due to a pathologic process, will neutralize the physiologic oblique resonance and shift it to that side; in bilateral involvement, if one side has an excess of vibrating medium the resonance will go there. One of our patients examined had a rather peculiarly shaped skull. The right side of his head in the region of the parietal bone bulged markedly. Although his hearing was normal, he would always lateralize the tuning fork sound from the central line of his head to that side (this equals the Weber test to right side). We, listening in, agreed that the sound was louder on that side, due, in all probability, to the larger vibrating mass.

Middle ear diseases, acute or chronic, presume an increased resonance for both examiner and examined, due to exudative and granulating tissue. This increased vibration for the patient is transmitted with an undiminished intensity to the examiner as there is no obstruction in the path of the traveling sound wave. The examiner will, therefore, hear the fork longer on the patient's head than he would on his own.

Cerumen will cause an increased resonance for the patient, but the transmission to the examiner will be interfered with, for the reason that there is an obstruction in the path of the sound wave. The examiner will, therefore, hear much less than the examined.

Inner ear lesions will cause the patient to hear the tuning fork on his head for a markedly shorter period than the examiner, with his normal hearing ability. If the vibrating fork is placed on the patient's head, he will perceive his own resonance louder and for a longer period in middle ear lesions; markedly shorter in inner ear diseases, and louder and prolonged in case of cerumen. The examiner, listening in, will also perceive an increased resonance in otitis media cases; he will hear normally long in inner ear lesions, and decidedly shorter when cerumen is present.

IMPORTANT DETAILS

There are several important details to be looked after in the performance of this new method of testing. It is necessary that the correct vibration time of the tuning fork used in performing the test should be known. If the examiner has some defect in his hearing, that should be definitely known and corrected or discounted so as to enable him to get accurate findings.

The tuning fork we used was a Hartman 256 double vibration, with no clamps. Its vibration time in a person with normal hearing, both by bone and by air conduction, is 70 seconds through the phonendoscope. Seventy seconds, therefore, represented the normal, and to this figure the findings were compared and deductions made.

We have tested over 300 patients with different hearing abnormalities by this newer method first, and checked up with the older methods afterward, that is, with speech, tuning forks, Galton whistle, etc., and concluded that the findings with the new method were not only correct but in many cases gave information that was more definite and clearer.

For instance, following the testing by the older methods, one could hardly state immediately that the patient has some obstruction in the canal, such as impacted cerumen, exostosis, furunculosis, etc. With the new method, however, the fact that the sound heard normally long by the patient (with the tuning fork on his head) is markedly decreased in duration for the examiner, points immediately to an obstruction in the pathway of the transmission of the sound via auditory canals, and through the auscultation tubes to the examiner's hearing apparatus.

The value of this method cannot as yet be accurately determined, but that it offers great hope for its usefulness is not to be doubted.

In view of the fact that the consistency of the skull and also that of its component parts (sinuses) play a great rôle in the shaping of the hearing results, these findings may in time point with marked accuracy to the presence or absence of sinusitis, sinus thrombosis, etc. The scope of these tests is probably only tapped at present.

Graphically expressed, a normal chart would look like the following:

Patient's line	<——————>	70′—70′ diagonal correct
Examiner's line	<——>	70′—70′ diagonal correct
Control line	<——————>	70′—70′

The first line indicates the patient's subjective findings; it shows that with the fork in the central points (eminence of frontal and parietal bones, root of nose, incisor tooth, protuberantia mentalis and occipitalis) he hears the sound equally with both ears; the 70′ indicates that the length of the hearing period is normal for either ear; the diagonal correct denotes that the examined lateralizes correctly, with the fork placed on either parietal eminence (to the opposite ear).

The small, similar line points out the examiner's findings (objective), and it shows that he corroborates in every instance the statements made by the patient. Both results are noted at the same time, the entire procedure lasting for about one and one-half minutes.

The third line is drawn when the fork is on the examiner's head (central line) and the patient is listening in. It states that the sound is heard by the examined equally well on both sides, providing the examiner's skull is normally shaped and his resonance normal and not disturbed by any pathologic changes.

The 70′ of sound transmission from the examiner's head, via air, to the hearing perception apparatus of the examined is normal for both ears. We say that the patient has a normal hearing perception. The diagonal resonance for the examined need not be taken, because his veracity and mental alertness has been gaged by the findings recorded so far. This procedure is gone through in about one and one-half minutes, so that the entire test need not take more than three minutes.

FURTHER GRAPHIC SKETCHES OF HYPOTHETIC CASES

Otitis Media, Acute or Chronic (Right Side Is Diseased)

Line 1	R	<———————	L	70′(+)—70′ Diagonal right
Line 2		<———		70′—70′(+) Diagonal right
Line 3		———————>		50—70′

Explanation:

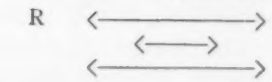
Line 1: With fork on any median point of patient's skull, he lateralizes to his right ear; hears on both ears the normal length of time (70′) or a little longer (on the right), on account of increased resonance; fork on either parietal eminence is heard best in the right (diseased) ear.

Line 2: This denotes that the examiner corroborates the patient's statements concerning lateralization and hearing time; he also gets the increased resonance of the patient's right in his left ear (note the plus).

Line 3: Fork on median points of examiner's head, for control. It shows that the patient perceives better with his left (healthy) ear, 70′, but suffers a loss of 20′ on his right (diseased) ear in the transmission of sound.

Note the similarity of statements of both the patient and the examiner.

Otitis Media, Acute or Chronic, Bilateral



R	L	(+) 70′—70′ (+) Diagonal correct
		(+) 70′—70′ (+) Diagonal correct
		40′—40′

Explanation:

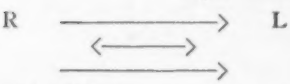
Line 1: The patient hears the fork from the median points, equally good in both ears (he hears in his head) and it lasts the normal 70′ or a little more; he lateralizes correctly from either parietal protuberance to the same side (mostly) or to the opposite (sometimes).

Line 2: This shows that the examiner corroborates the patient's statements, and he also perceives the increased resonance of the patient's skull (plus).

Line 3: This denotes that the patient hears the examiner's fork equally on both sides, but the duration is lessened, 40′—40′. Diagnosis: lesion in both middle ears of equal intensity.

Note the similarity of statements of both examiner and examined.

Eight Nerve Involvement (Right Side)



R	L	40′—70′ Diagonal to left
		70′—70′ Diagonal normal (right and left)
		40′—70′

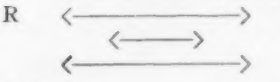
Explanation:

Line 1: The patient lateralizes to the left from any median point of his skull; he hears the sound for 70′ (normal) with his left, healthy ear; and has diagonal resonance to this side. On the right side (diseased) he perceives only 40′.

Line 2: The fork is heard equally well by both ears; the duration is normal (70′—70′); the diagonal resonance is typical.

Line 3: The fork on median points of examiner's head is heard best by patient's left (healthy) ear, 70′, with only 40′ duration on the right (diseased) ear, therefore, a loss of 30′. Diagnosis: Involvement of eight nerve on the right side. Note that there is no relationship between the findings of both the patient and the examiner.

Bilateral (Equal) Affection of the Eight Nerve



R	L	40′—40′ (shortened) Diagonal normal
		70′—70′ (normal) Diagonal normal
		40′—40′

Explanation:

Line 1: The fork on median points shows a diminshed perception in the patient's both ears (40′—40′); hearing in the head and diagonal resonance are typical.

Line 2: The examiner localizes from the median and outside points of patient's skull in normal fashion, but hears the latter's fork for the normal period of time (70′—70′).

Line 3: The patient correctly localizes the sound of the examiner's fork but hears it markedly shorter, 40′ on each side, a loss of 30′ respectively. As in unilateral cases, there is no relationship between the findings of examiner and patient. Diagnosis: bilateral inner ear affection.

Complete Obstruction Deafness (Right Side) Due to Cerumen, etc.

R	<———————	L	(+) 70′—70′	Diagonal to right
	———————>		0′—70′	Diagonal to left
	———————>		0′—70	

Comment:

Line 1: The fork on median points of patient's skull is lateralized to right (diseased) side; he hears the normal time length or somewhat prolonged and diagonal resonance goes to the right.

Line 2: The examiner lateralizes to the patient's left (healthy) side because no sound is transmitted from the patient's right; he hears, therefore, nothing from the right, but normal time from the left side of patient's head.

Line 3: The fork on the median points of the examiner's head will be heard by the patient on his left side in normal time, but nothing will be transmitted to his right ear on account of the obstruction.

Note the contradiction between the statements of examiner and examined.

Equal Deafness in Both Ears, Due to Impacted Cerumen, etc.

R	<———————>	L	70′—70′	Diagonal correct
	———————		0′— 0′	None
	———————		0′— 0′	

Comment:

Line 1: The fork on the patient's head will be heard equally well by both ears (in the head) for the normal length of time or somewhat more. Diagonal resonance will be typical.

Line 2: The examiner hears nothing, as no sound is able to pass the obstruction in the patient's head.

Line 3: The fork on the examiner's head cannot be heard by the patient on account of the obstruction in his ears.

In incomplete bilateral obstruction, the patient will hear his own fork normal time length, but it will *appear* markedly longer *compared* to the perception of the examiner which is markedly shortened, due to the difficulty of the sound transmission from the patient. In other words, the resonance (of the patient) is *apparently* shortened (as perceived by examiner).

DIFFERENTIAL DIAGNOSIS

If the patient has an impaired perception, it could be due to either middle or inner ear diseases, or to mere obstruction by a foreign body. Characteristic for middle ear troubles is increased resonance and similarity between the statements of both the patient and the examiner.

Diagonal resonance is to the same side (mostly). In inner ear affections the patient's perception is impaired; he will hear less than the examiner. The perception is shorter than the resonance. There is diagonal resonance to the opposite side. In obstruction of the canals, the patient hears *apparently* longer than the examiner. Perception *apparently* is longer than resonance. All these differential tests are made with the fork on the patient's skull.

Line 1 denotes skull resonance and tests the nerve function.

Line 2, or control line, the examiner does or does not corroborate the statements of the examined.

Line 3 tests the middle ear and auditory canal disturbances, cerumen, furunculosis, exostosis, otitis media suppurative or nonsuppurative, etc.

COMMENT

It is understood that these findings can show great variations. We have attempted to show a few extreme typical cases to act as guides, and variations will be found ad infinitum. It is, however, easy to see that the reports can quickly be recorded and read and interpreted, both by examiner or any other persons familiar with this technic.

Of course as in all procedures, be they ever so simple, attention to details is necessary. It is also necessary to repeat the test at frequent intervals so as to check up on findings and note improvements or regressions. In our cases we have noticed that the reduction in hearing can be told in simple terms to the patient and family by the following rule:

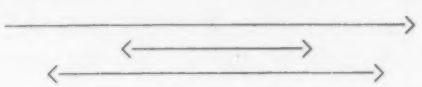
With fork on center line of patient's head, the hearing in both ears being equal:

60 seconds, hearing mildly impaired
50 seconds, hearing poor
40 seconds, hearing bad
30 seconds, hearing very bad
20–10 seconds, almost completely deaf
0 seconds, stone deaf

With tuning fork on examiner's head and patient listening in:

60 seconds, slight impairment
50 seconds, mild impairment
40 seconds, poor hearing
30 seconds, very poor hearing
20 seconds, bad hearing
10 } seconds { very bad hearing but not total deafness
0 } seconds {

B., a man, following a head injury one year before, was sent to the office for examination, claiming that he was totally deaf in his right ear since that time. His tests showed the following:



0-70 Diagonal to left
70-70 Diagonal normal
70-70

Line 3: The patient still persisted that he did not hear with his right ear (that is, he denied the transmission of the fork sound from the examiner's skull to his right ear). However, quietly compressing the tube leading from the right ear of the examiner to the left ear of the examined, he heard the sound; now, any sounds the examined heard must have gone into his skull through his right ear, therefore his claim "right ear total deafness" was impossible and the report sent in was, that he was malingering. Other tests for malingering verified this report.

SUMMARY

There are several important things this method of testing the hearing offers us:

1. This method is much more rapid than the older methods; the hearing tests can be performed in three minutes (it is thus a time saving procedure).

2. This method controls the subjective findings of the patient with the objective findings of the examiner, thus checking up on the answers given by the patient; we are, therefore, able to locate abnormalities very quickly.

3. Improvement, if present, can be definitely and rapidly noted from time to time.

4. This method can be performed by a nurse or secretary.

5. This procedure places the hearing tests on a numerative basis, so that the patient or his physician can be told the exact amount of his hearing in a percentage formula.

6. We know exactly the specific value of every point of contact between fork and bone in reference to resonance, and we always use the same spot during the entire procedure, thus avoiding the faulty conclusions of the ordinary way of testing.

7. It does away with the impossible task of always striking the fork with the same force. Since we use the same fork, we found that the time required for the complete fading of its vibrations is always the same, no matter how you strike it.

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SOME RECENT OTOLOGIC PROBLEMS*

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It is my purpose to give a general survey of some of the more recent otologic problems, and to show in what manner the histologic examinations of the ear, aside from their scientific interest, have also given practical results.

The pathology of the ear is still of recent date, when compared to that of other organs of the human body. The special cause for this must be ascribed to the complicated microscopic technic, which could only be cultivated successfully after the introduction of decalcination and celloidin embedding forty years ago by Steinbrügge and Habermann.

In his work, Retzius has compiled and materially increased our knowledge of human and comparative anatomy of the ear; his illustrations are to be found even to this day in the manuals and textbooks. The most minute details, however, could only be found by the recent methods I have just mentioned.

In the first eagerness which followed this invention, a number of pathologic changes were described in the labyrinth, which, however, proved to be deceptive later on. The experimental labyrinth histology demonstrated that we have to reckon with many possibilities of error, especially in the human labyrinth, when fixation and embedding are not quite perfect.

Shortly after death, the neuro-epithelium and spiral ganglions of the inner ear undergo a considerable change; even a long agony, according to some authors, is supposed to cause histologic alterations. The extensive literature on necropsy, cadaver and agonal changes proves that many of these, described originally as pathologic, are caused by an early setting in of decomposition.

Therefore, in experimental research work, only the intravital fixation of the ear should be utilized in order to obtain faultless sections for comparison.

With human specimens, this method of fixation is not possible. It had, therefore, to be ascertained first of all which changes might be interpreted as cadaverous symptoms and which as pathologic variations. To be absolutely sure, these specimens should have belonged to persons with normal hearing, who were functionally tested while alive. The necropsy should be carried out directly after death, and the petrous bones removed skilfully from the body to prevent the flowing out of the perilymph and endolymph. Even considering all these circumstances,

* Read before the Harvey Society, New York, Oct. 3, 1925.

many sections are not usable, owing to imperfect embedding or decalcination, so that the human labyrinth pathology offers many difficulties and disappointments.

CELLULAR CHANGES

At the present time, we have to reckon with the fact that cellular changes in human labyrinth pathology can hardly be considered reliable. In research on effects of poisons or toxins (alcohol, quinine, salicyl) on the neuro-epithelium of the labyrinth, only specimens from intravitally fixed animals may be utilized.

As pathologic changes, we admit only distinct numerical deviations, for instance, the absence of the auditory cells of Corti's organ, atrophy of the spiral ganglion and of the nerve fibers, provided fixation and embedding are considered to be faultless.

MIDDLE EAR CHANGES

Histologic examinations of the middle ear have cleared up many problems. The changes here are easier to interpret than in the labyrinth, because the fixation occurs more readily. The mucous membrane, as in the paranasal sinuses, is at first purely cylindric and rests on a myxomatous filling tissue in the fetal organ; in the developed organ, however, it lies almost directly on the bone. With increasing development it becomes flatter, especially in the higher and peripheral sections, and appears in the antrum and in the mastoid air cells as a sort of endothelial layer, which regains its former character under the influence of inflammation. This change of the mucous membrane is connected in a certain way with the problem of the pneumatization of the mastoid, a process particularly characteristic of the skull and agreeing with the principle of surface enlargement without increase of weight.

The frequent changes occurring in the middle ear of the new-born were formerly supposed to be due to infection (otitis neonatorum). Irritation by foreign substances after desquamation of mucous membrane, or aspiration of amniotic liquor and pharyngeal mucus, are now made responsible. According to Wittmaack and his school, there then results an interference with the normal involution of the fetal filling tissue and thereby with the later pneumatization of the mastoid. This leads to an irregularity of the air cells, combined with a tendency to complications in patients with empyema.

At present, this question is of great interest and of considerable practical importance. Attempts, therefore, were made to obtain an idea of the mastoid pneumatization in every patient before operation. This was only possible after perfecting the roentgen-ray examination of the ear.

Nowadays, this method affords us welcome assistance in the diagnosis, not only of the mastoid, but also of the labyrinth conditions (fractures, etc.).

Microscopic examination of the middle ear conditions revealed many different types that we will now briefly review.

Every inflammatory condition of the nasopharynx may affect the middle ear, even without apparent symptoms; hence the conception of the latent otitis media, well known in pediatrics, which often explains doubtful symptoms.

The middle ear is affected primarily in acute exanthematic diseases (scarlet fever, measles, diphtheria) under the aspect of an enanthema, as in the nose and throat, and causing an exudation which on otoscopic examination is often invisible. This primary condition may heal, or by secondary infection it may lead to the more serious suppuration.

Histologic examinations have further demonstrated that tuberculous otitis during childhood does not occur so rarely, and may even assume the aspect of an ordinary middle ear inflammation. This has since been confirmed by testing tissue, removed during operations. Thanks to this knowledge, such patients will now be cured earlier and more completely of tuberculosis by the same after treatment as used in surgical tuberculosis.

Researches in malignant forms of otitis media showed that the mucous membrane and rather frequently the connective tissue and bone underneath, becomes necrotic and ulcerated, so that the inflammation may extend to the labyrinth or to the fossae.

The further history of these ulcerations deserves marked attention on account of their relationship to the genesis of cholesteatoma. Cholesteatoma of the middle ear was formerly considered a tumor of congenital origin; later on, as resulting from metaplasia of the mucous membrane of the middle ear.

Now we know that cholesteatoma is caused by an epithelization of the ulcerated mucous membrane from the external meatus. In order, however, that the epithelium may grow into the middle ear, there must be an epitympanic and marginal drumhead perforation, usually observed in the course of malignant ear suppuration.

This process, which doubtless represents a self-healing one, may become dangerous, if the epidermic scales or cholesteatoma masses accumulate, and, being retained by insufficient external connection, become infected. This danger can and has to be prevented by intratympanic syringing with attic tubes, or in patients in whom space conditions are unfavorable, by creating wide communications of the cholesteatoma cavity with the meatus by means of a radical mastoid operation. The matrix of the cholesteatoma can and must be treated

with care, because we are not able to produce a better substitute; besides, convalescence after operation is shorter and the hearing is better.

The influence of this research work and its practical conclusions became evident from the statistics, showing that mortality from chronic middle ear suppurations, formerly quoted as 8 per cent., has now been reduced to 1.33 per cent. Presumably this will be reduced still more as soon as the diagnosis of cholesteatoma becomes more generally known, thereby doing away with many dreaded complications.

COMPARISON OF INVESTIGATIONS

A comparison of the clinical and functional with the microscopic investigations made it further possible to separate the different types of middle ear deafness from each other, for instance: the results of former ear suppurations—chronic adhesive processes—from otosclerosis. This distinction is of practical importance, because in the first case deafness is mostly stationary and is sometimes amenable to local treatment, while in otosclerosis it is prognostically of an entirely different significance.

The studies of the normal and pathologic anatomy of the bony labyrinth occupy a large space in otohistology. The labyrinth capsula may be considered as being one of the best known fields of bone pathology, by reason of the great amount of otologic research work. It occupies a special place in the human skeleton, because it is not subject to the influences of statics and mechanics, through which an important everlasting conservation of its hollow spaces is assured.

Up to old age, the capsula exhibits embryonic parts. Moreover, the vital functions of the bone tissue, that is, the constant reconstruction by resorption with succeeding apposition, is absent in the bony labyrinth or is only present in the outermost periostic layers. At birth, it has almost reached its normal size, and grows only by apposition of periostal bone layers. The ordinary bone diseases—osteomalacia and rickets—do not attack it. Paget's bone disease affects it in the last stages. In congenital bone conditions only, such as osteogenesis imperfecta, quite naturally the capsula is diseased.

On the other hand, there is one disease in the capsula which always attracted great attention, namely, otosclerosis. In spite of infinite labor, spent on the exploration of this ailment, we are as yet a long way from having attained the necessary knowledge. The cooperation of all colleagues is most urgently required. A sickness is involved, incurable to this day, which ruins many a life, and has made many people and their families unhappy. Our present knowledge proves that it is predominantly a bilateral primary constitutional bone disease, referable to a congenital and hereditary disposition. It is independent of middle ear diseases, and mostly, but by no means always, shows a progressive char-

acter; it starts during or is influenced by certain periods in life, such as puberty, pregnancy and the puerperium.

So far as our knowledge goes, heredity is not always manifest in the same way, though in more than 50 per cent. a history of family deafness can be obtained. Females generally are afflicted more frequently. The clinical diagnosis is based on Bezold's triad, with an absolutely normal, even transparent drumhead and reddened promontory. This complex of symptoms, however, can only be observed when otosclerosis has spread almost to the stapediovestibular joint and has led to ankylosis of the stapes. If otosclerosis begins in other parts of the capsula, it remains without symptoms or produces an aspect of labyrinthine deafness, through pressure on the auditory nerve and its branches.

Histologically, a pathologic reconstruction of the bone is present, mostly on predisposed places with tangled remnants of bone. In the first place the normal bone is absorbed and replaced by unripe osteoid tissues, which again change continually, until finally lamellar bone appears and the process comes to a standstill.

This disease is considered unique in general bone pathology, having certain similarities only with osteitis deformans (Paget), which, however, deviates greatly from the clinical aspect of this illness. According to later views (O. Mayer), the histologic changes are considered as being growths of embryonic tissue anomalies, known as hamartomas. Contrary to isolated statements, we have not as yet succeeded in creating this disease experimentally.

Our histologic knowledge, unfortunately, has not led us to any successful therapy in these cases. It may, however, prevent us from giving inexpedient local measures such as operations, massage, etc.

HISTOLOGIC INVESTIGATIONS

The histologic investigations in the labyrinth and especially experimental researches, have again materially advanced our knowledge of pathologic changes. I should like to point this out in some instances.

The necrotic middle ear inflammations, to which I have repeatedly referred, and to which also belongs tuberculosis, may bring about an inflammatory irritation of the inner ear, even without having invaded it; this condition is called labyrinthitis serosa.

Several changes point to the fact that such inflammations may heal spontaneously. This affords an explanation for the observation of passing irritations and functional disturbances of the labyrinth. The spontaneous healing of several forms of labyrinthitis, partly with and partly without restoration of function, narrowed the indication for the labyrinth operation still more, so that today this dangerous operation (with a mortality of 20 per cent.) is performed much less frequently than formerly.

That the result of a microscopic ear examination may also have practical importance, was experienced by me some years ago. A patient, whom I examined because of traumatic deafness, which developed after a fall on the head, died about six months later of meningitis, for which the pathologist could not find any cause. In the labyrinth I found multiple fractures, healed only on the surface, and at the same time a middle ear suppuration along the fracture lines downward, which was the cause of death.

DEAF-MUTISM

Our knowledge of deaf-mutism, especially of its congenital form, as a matter of fact, could only be acquired through the use of modern histologic methods. Entirely new aspects may be seen here, all of which, however, are not symptomatic of deaf-mutism, but may be found in the labyrinths of patients who later became deaf or who were only hard of hearing. Clinically as well as pathologically, the aspects of deaf-mutism and simple deafness do not always differ much.

The causes of deaf-mutism, as is well known, are manifold. Partly they are the aftermath of children's disease (meningitis, scarlet fever, measles, diphtheria, etc.) or injuries. Partly they go back to congenital labyrinth deformations, which in turn are explained as malformations or remnants of intra-uterine inflammations.

Some forms are well known from the clinical and pathologic aspect, for instance, deaf-mutism following cerebrospinal meningitis or scarlet fever. Furthermore, we are well acquainted with endemic and cretinistic deafness, which is frequently observed as a symptom of endemic cretinic degeneration in some mountainous countries (central Alps of Europe, and of Asia) and is coupled with goiter, dwarfism and imbecility.

Certain labyrinth changes in deaf-mutes are also found in congenitally deaf animals (albino cats and dogs). The constitutional or hereditary degenerative form of deaf-mutism is quite common. Our researches have only begun, and there is still much to be explored. There is no doubt, however, that by this work practical as well as scientific results, will be realized.

I should like to mention the chapter dealing with noise deafness or acoustic trauma, in order to show you how fruitful laboratory research has been from the clinical and prophylactic point of view. It is a well known fact that violent detonations and explosions, or continuous sound impressions, especially in shipyards and boiler factories, lead to deafness. We only need be reminded of deaf artillery men, of boilermarkers, locksmiths, coopers, shoemakers, etc. By the histologic examination of such labyrinths, a degenerative atrophy of the neuro-epithelium may be found, beginning in Corti's organ and later affecting the spiral ganglion, especially in the basal coil.

Wittmaack, Siebenmann and their pupils have subjected the ears of animals to loud and single tones at first, then to long continuous noises, and finally to repeated detonations. The entire degenerative process could be shown and followed up in almost all stages. Long continuous impressions of single tones caused destruction at quite a definite spot of the cochlea, so that a new proof of the correctness of the Helmholtz theory was gained thereby.

By constant noises, when the conditions surrounding a boiler-maker were imitated, changes resulted which absolutely resembled those of human noise deafness. The impression of single or of repeated detonations caused diffuse destruction of Corti's organ, which resulted either in temporary—that is to say, curable—or lasting changes with ascending degeneration of the eighth nerve, according to the duration and intensity of the injuries. In such cases, the mechanical effect of strong air concussions is combined with the acoustic.

The question, whether the condition is due to air or to bone conduction of the noise, could be determined indisputably at Siebenmann's clinic, by showing, through eliminating the air conduction by removing the incus, that the inner ear was then not affected by acoustic injuries. These tests resulted in the practical conclusion that workmen in such noisy establishments can, in fact, protect their labyrinth by a hermetic closure of the meatus against such injuries.

CONCLUSION

In this short paper, I have tried to give some theoretic and practical results of otohistologic laboratory research work, in the hope of stimulating interest in it.

Our knowledge concerning many problems is still fragmentary, and we need the cooperation of all colleagues in all countries for the furtherance and advancement of the exploration of these problems. We need also the assistance of our physiologic, medical and surgical colleagues in this special field, in order that we may realize the aim of every physician and scientist, regardless of nationality, namely, to alleviate or to cure the suffering of our sick fellow men.

ACUTE PEMPHIGUS OF THE THROAT, WITH POSITIVE VINCENT'S ANGINA

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Pemphigus in the chronic state is not so infrequent that it requires any extensive discourse. The prevalence of pemphigus which starts acutely and the course of which is of short duration, ending practically always in death, is yet so infrequent that a perusal of the literature and a review of a recent case might be of sufficient importance to warrant this discussion. The particular case which is being reported carried with it a few perplexing factors which complicated the early diagnosis.

ETIOLOGY

As to the etiologic factor of this disease, suffice it to say that as yet no satisfactory solution has been presented. Various strains of streptococci, endocrine disturbances, animal lymph inoculation, and the so-called specific bacterium pemphigi of Eberson,[1] all have been expounded. Although the work of Eberson has some grounds for his claims, yet like the rest, unfortunately, the results are not conclusive nor borne out by others.

The age incident ranges from the early twenties to the late seventies, with a slight prevalence of females over males. As in this case, it is found that a high percentage of the patients are Jews.

The occurrence of acute pemphigus which subsides and terminates in a cure has been denied, and the probability exists that such diagnoses are in error. The late Dr. John Fordyce, in discussing this topic with one of us, remarked: "Where such a case has been claimed to be cured, the possibility is that the diagnosis was incorrect." That such mistakes are probable is not so surprising when it is remembered that the diagnosis is founded on lesions which are in appearance so closely similar to some of the lesions of dermatitis herpetiformis, urticaria bullosa, erythema bullosa, pompholyx, dermatitis venenata and others. The lesions per se certainly are not absolutely indicative in specificity, but rather the entire general course of the disease should be taken into consideration.

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1. Eberson, Frederick: Studies on the Etiology of Pemphigus, Arch. Dermat. & Syph. **8**:204-232 (Aug.) 1923.

REPORT OF CASE

History.—J. A., a man, aged 54, married, Jewish, a real estate agent, came to us with the complaint of a sore throat, which caused a tightness and a difficulty in swallowing; the duration of these complaints dated back but three days, prior to the time of his first visit. The patient had a wisdom tooth extracted one week before the onset of the throat trouble. He developed a slight hoarseness on the second day of his illness. The past history was unimportant other than revealing a slight attack of the grip ten years prior to examination. The present history was likewise unimportant, other than to show that he was apparently in an excellent state of health previous to this complaint.

Physical Examination.—The general physical examination showed a fairly well nourished and developed man. The heart and lungs were apparently normal; the abdominal examination was negative; the blood pressure was 152 systolic, 96 diastolic; the urine showed a slight trace of albumin, but no findings were noted microscopically.

The general facies was that of a man who was in some distress; there was a profuse salivation which necessitated carrying a handkerchief in the hand.

The examination of the mouth and pharynx revealed diffusely distributed, macerated, irregularly shaped ulcerations of the mucous membrane of the hard palate, and on the sides of the left and right cheeks in the region of the posterior molars. This denuded mucosa was irregular in outline, very superficial in depth, and had what appeared to be a pseudomembrane over it, which on removal left a bleeding surface; it had a slightly indurated and reddened margin.

Diagnosis.—The diagnosis at that time was Vincent's angina, which diagnosis was strengthened by the report from the laboratory that the smear showed an abundance of spirochetes and fusiform shaped bacilli, with the report of positive Vincent's angina.

Treatment.—Treatment was instigated which included exposing the pharynx to the Kromayer quartz rays, applying a solution of equal parts of wine of ipecac and Fowler's solution. The patient was instructed to irrigate his throat with hot alkaline solution.

Course.—On the next visit, which was on the following day, he reported that he felt better, that he was able to swallow with more ease. The area looked less angry, and the pseudomembrane was not present.

On all of the visits there was a noticeable raw flesh odor to his breath.

Subsequent treatment was similar to that first given; however, his response was not very encouraging, as new lesions continued to form while the old lesions, although appearing less acute, nevertheless failed to organize. Most of the new lesions were on the buccal surface of the lower lip and along the margin of the floor of the mouth and the gums. At no time were bullae noticed.

At the end of ten days the patient complained of increasing hoarseness, and reexamination of the larynx showed marked congestion of the cords and the trachea, but no ulcerations were seen.

The blood Wassermann test was negative on two occasions; Vincent's angina was again positive, and, as the condition did not seem to be progressing favorably, it was determined to give the patient an intravenous injection of arsphenamine, and 0.3 gm. was given with no reaction.

Three days later, the seventeenth day of the disease, for the first time the patient developed bullae on the soles of both his feet. This was the first evidence of any skin lesion. No other skin lesions occurred for the next five days, although new lesions continued to crop up in his mouth.

On the twenty-second day of illness bullae were definitely seen in his mouth, on the buccal surfaces of his lips, for the first time.

With the first appearance of the lesions on the soles, the differential diagnosis was to determine:

1. Were we dealing with a case of Vincent's angina plus a secondary skin lesion?

2. Did the arsphenamine precipitate, and act as a provocative in bringing forth a secondary syphilitic lesion?

3. With the strict localization of the lesions, were we dealing with an isolated case of hoof and mouth disease?

4. Were we dealing with a case of acute malignant fulminating pemphigus?

Soon, however, generally distributed typical bullae over the patient's entire body began to develop, and with his rapid decline, the diagnosis of pemphigus was made.

The patient soon became septic, and rapidly became worse; in five weeks from the onset of the disease he died.

SUMMARY

1. Acute pemphigus is malignant.

2. Ten days after the removal of a wisdom tooth, the first symptoms developed. Were we dealing with a case of acute infected pemphigus starting with injury?

3. Lesions were limited to the mouth for seventeen days.

4. Positive Vincent's angina was reported. The blood Wassermann test was negative.

5. There was rapid development of bullae over the entire body after their first appearance on the soles of the feet.

6. Death occurred in five weeks from the onset of the disease.

Clinical Note

TERATOMA OF THE THROAT

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History.—E. C., a boy, aged 11 weeks, whose home was in Lima, Ohio, was brought to me on Nov. 21, 1925. The parents noticed that from birth the child not only had difficulty in breathing but had occasional paroxysms of suffocation which were relieved by holding the child upside down and patting him on the back. When about 5 weeks of age, the child had an attack of suffocation, following which a rounded tumor appeared in the throat at the base of the tongue and then disappeared, apparently being swallowed. Frequently thereafter this tumor was noticed, and the attacks of dyspnea appeared to increase in number and severity. Occasionally the tumor seemed to drop down from the nose, postnasally.

Physical Examination.—The baby was well nourished and apparently normal in every other respect. A casual examination of the throat was negative, but when the child began to cry, a growth the size of an elongated filbert came forward to the base of the tongue, only to disappear on inhalation or swallowing. While the child was crying the growth apparently closed the laryngeal opening and created temporary dyspnea, relieved by spasmodic expulsion. With the laryngeal speculum this tumor was found to be the size of an elongated filbert, semisolid, smooth in contour and apparently attached just above and behind the left tonsil by a pedicle about 1 inch in length.

Pathology.—The tumor and a considerable part of the pedicle was removed with snare, and submitted to Dr. B. W. Rhamy, pathologist, whose report is as follows: "The sections of the tumor taken from the nasopharynx of this child shows the tumor to be a teratoma. It is a pedunculated skin-clad tumor. Microscopically, the outside portion of the tumor shows a covering of natural skin with its normal layers. The center of the tumor is connective tissue. A cross section of the base of the pedicle shows a hyperplasia of the skin glands almost suggesting adenoma."

The patient has made an uninterrupted recovery, and from the fact that the tumor is congenital and teratomatous it is expected that there will be no return.

COMMENTS

Lennox Browne[1] in his comprehensive textbook, said that "teratomas of the nose or throat are of such rarity as to be viewed mainly as pathologic curiosities." This dictum seems not to have changed during the passing years, for I have been unable to find any more comprehensive discussion of the subject in any of the well known textbooks on diseases of the nose and throat. Even the works on pathology, including neoplastic diseases, have little to say concerning teratoid tumors except as associated with extensive deformities of the skull, or in the development of monsters.

McFarland[2] refers to teratoma as a tumor of complicated structure, presenting tissues representing all three layers of the blastoderm, sometimes with, sometimes without, definite arrangement; these are most frequent about the

1. Browne, Lennox: Diseases of the Nose and Throat, Ed. 5, Philadelphia, J. B. Lippincott Company, 1899.

2. McFarland, Joseph: Textbook of Pathology, Ed. 2, Philadelphia, W. B. Saunders Company, 1910.

pelvis and are frequently styled sacral teratomas. McFarland makes the general statement that teratomas rarely are seen.

Adami and McCrae[3] say that teratomas occasionally are encountered growing from the pharynx or from the palate. "When it forces its way through the roof of the mouth as a pediculated mass it is called epignathus, and these masses have at times been found to contain bone and tissues representing all three original layers, namely, epiblast, mesoblast and hypoblast."

Ewing[4] describes teratoid tumors as analogous to dermoids but differing from the latter in the greater complexity of structure. Epignathi are described as differing from pharyngeal teratomas in presenting well formed organs and limbs of the parasitic fetus.

A much more comprehensive discussion of the subject will be found in Sutton's[5] textbook, in which the following description is given.

"It is noteworthy that the parts in relation with the cephalic as well as the caudal extremity of the notochord are common situations for tumors resembling teratomas, in that they contain formed organs and normal tissues such as bone, skin, striped muscle, nerves, epithelium and the like, but devoid of any shape and arrangement of the parts to suggest a fetus, though arising in the same manner as a parasitic fetus. To these conglomerate tumors, the

Teratoma (actual size) from nasopharynx of infant, aged 11 weeks.

adjective teratoid is appropriately applied. In the palate and nasopharynx teratoid tumors usually take the form of pedunculated tumors clad with skin which is often pilose. The core of these tumors consists of connective tissue which may contain hyalin cartilage and a variable amount of striped muscle tissue. Tumors of this kind are congenital, rarely large, and in many cases is is difficult to decide whether the tumor grows from the palate or from the base of the skull and projects through a gap in the bony palate. Sometimes the attachment is so slender that the dermoid undergoes spontaneous detachment; in the case reported by Lambl the child swallowed the tumor and voided it the next day by the anus. Occasionally the tumor is sessile, and may even project into the floor of the pituitary fossa and compress the optic nerves and tracts.

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3. Adami, J. George, and McCrae, John: Textbook of Pathology, Philadelphia, Lea & Febiger, 1912.

4. Ewing, James: Neoplastic Diseases, Philadelphia, W. B. Saunders Company, 1919.

5. Sutton, J. Bland: Tumors, Innocent and Malignant, Ed. 4, 1907, p. 427.

"Windle has collected the literature relating to teratoid tumors of the pharynx under the title of 'Epignathus,' and has summarized the various views in regard to the nature of this condition.

"In describing teratomas, particular care was taken to emphasize the fact that many cases of duplicity of parts depended on dichotomy. Cleavage may be so slight at the cephalic end of the embryo as only to involve the face or even the jaws. Of this I have described several specimens, which make it clear that an identical state of things takes place in connection with the jaws as with the pelvic limbs. When this is the case, the supernumerary maxillae fuse together and are impacted in the nasopharynx and fixed to the base of the sphenoid. I have examined a large number of specimens (many of which are preserved in the splendid teratological collection of the museum of the Royal College of Surgeons), in which every gradation is traced, from well-formed maxillae with unerupted teeth to a confused lump of teeth, bone, and cartilage impacted in the palate, but firmly united by a broad base to the sphenoid in the neighborhood of the pituitary fossa."

PROGRESS IN OTOLARYNGOLOGY

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

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PERORAL ENDOSCOPY

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The literature of bronchoscopy published during the last year clearly indicates that the bronchoscopist of the future will be engaged with the diagnosis and treatment of pulmonary disease in hundreds of cases to one of foreign body.

In a masterful review of the subject of peroral endoscopy, André Soulas [1] refers to the remarkable developments in technic that have justified the practitioner in resorting without hesitation to the bronchoscopist for both the diagnosis and the treatment of pulmonary disease. He refers to the diagnosis, by bronchoscopy, of compression stenosis of the trachea due to aneurysm, mediastinal tumors, substernal goiter, thymic hypertrophy, adenopathy, tracheal urticaria, benign and malignant tumors of the bronchi and lungs, gummas and cancer of the adjacent portion of the esophagus. He believes strongly in the efficacy of bronchoscopic treatment of chronic bronchial and pulmonary disease, bronchial asthma and suppurative foci. Excellent results have been obtained under his observation by the bronchoscopic treatment of the sequelae of gassing. By the close cooperation of internist, roentgenologist and bronchoscopist, Soulas forsees a great future in the development of diagnosis and treatment of pulmonary disease.

LUNG SUPPURATION

Post-tonsillectomic Lung Abscess.—The prevailing opinion seems to indicate that there is an increase in the incidence of lung abscess following operations on the throat and nose. No new observations have been made to support either the aspiration or the embolic theory of their causation. Although lung abscesses as a complication of operations on the thorax and abdomen are being reported, the relative frequency of their occurrence is not nearly so great as the cases observed after operations on the throat and nose, notably on the tonsils. Of thirty-four cases of lung abscess reported by Pincoffs,[2] ten cases developed shortly after tooth extractions or operations on the nose or throat, and eight cases

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1. Soulas, André: Interet de la tracheo-bronchoscopie pour le medecin praticien, Progrès méd. **49**:1851 (Nov. 30) 1925.
2. Pincoffs, M. C.: Abscess of the Lungs, South. M. J. **18**:777 (Nov.) 1925.

after operations elsewhere. He believes the former group to be the result of aspiration and the latter to be of embolic origin.

The importance of bronchoscopy as an aid to the internist and the surgeon in the diagnosis and treatment of lung suppuration warrants its consideration as a recognized method of procedure in certain cases; final conclusions, however, cannot be arrived at regarding its ultimate value, since for definite conclusions on all phases of the subject of diagnosis and treatment, complete data on at least 10,000 cases should be available for analysis (Jackson).

The efficiency of bronchoscopy in treatment is thought by some authors (Jackson) to result from the good drainage through the mouth by bronchoscopic aspiration rather than through local medication. Pincoffs [2] agrees that in cases of acute lung abscesses which do not improve under medical treatment with postural drainage and in which the general condition of the patient is satisfactory, bronchoscopic treatment should be given a trial.

According to Jackson and his co-workers,[3] the theory of bronchoscopic treatment of lung suppuration is founded on impairment or inefficiency of the natural pulmonary defensive mechanism, namely, the cough reflex, the ciliary activity and germicidal action. The expulsive effort of cough and the coincident compression of the lung unquestionably contributes a great deal in forcing up secretion from the periphery of the lung, but probably the most potent factor in maintaining upward drainage is the action of the cilia, which are constantly sweeping upward. The nature of the germicidal action has not been definitely determined but its presence has been experimentally established. If there is a failure of the natural protective mechanism, then bronchoscopy is often called on for assistance. A number of cases are reported in which early bronchoscopic aspiration resulted in complete cures.

In a review covering thirty-two cases of lung abscess treated by bronchoscopic aspiration, Myerson [4] believes that bronchoscopy offers a good chance for a cure in abscess cases of short duration. In long standing cases, the results are not so satisfactory because of the extensive changes that have taken place about the suppurative focus, however, many of these patients can be made comfortable and practically symptom-free as a result of bronchoscopy.

Clerf and Lukens,[5] in a review of the routine treatment carried out at the Bronchoscopic Clinic, stress the importance of cooperation between

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3. Jackson, Chevalier; Tucker, G.; Clerf, L. H.; Lukens, R. M., and Moore, W. F.: Bronchoscopy as an Aid to the Thoracic Surgeon, J. A. M. A. **84**:97 (Jan. 10) 1925.

4. Myerson, M. C.: The Bronchoscopic Treatment of Lung Abscess, Surg., Gynec. & Obst. **41**:573 (Nov.) 1925.

5. Clerf, L. H., and Lukens, R. M.: Bronchoscopy in the Diagnosis and Treatment of Lung Suppuration, J. Indiana M. A. **18**:1 (Jan. 15) 1925.

the internist, roentgenologist, surgeon and bronchoscopist, so that all available data can be secured to assist in the selection of the proper plan of treatment.

Cassidy [6] reports a case of pulmonary abscess involving the left upper lobe which occurred following the extraction of teeth under nitrous oxide anesthesia. Bronchoscopic treatment was instituted, the patient making a complete recovery after six treatments.

Bronchoscopy in Asthma.—The results of bronchoscopy in the treatment of asthma must be carefully evaluated, for, as observed by Lukens,[7] more cures for asthma have been discovered and abandoned than in the case of any other disease. He reports observations made on a series of twenty-one cases, and believes that the results in some of these have been so striking that bronchoscopic treatment is justifiable and states that this form of treatment has become a routine procedure in certain well selected subjects at the Bronchoscopic Clinic. Some of the bronchoscopic findings have been so constant that it is possible to divide the cases into four groups:

A. Those subjects with chronic suppurative tracheobronchitis.

B. Those with chronic catarrhal tracheobronchitis.

C. Patients with cyanotic mucosa without suppuration.

D. Those with urticarial patches.

In group A, there was found an abundant mucopurulent material more or less adherent to the tracheobronchial mucosa. Group B presented a rather intensely inflammatory mucosa, which was velvety in appearance with a small amount of nonpurulent secretion present. In group C, the mucosa was distinctly cyanotic, and its appearance did not change after bronchoscopy. The group D cases, two in number, presented several inflammatory spots on the mucosa. In several subjects, a collapse of the trachea during cough and expiration was also observed. Lukens concludes that bronchoscopic treatment is of value in the treatment of patients with asthma, with associated pathologic changes of the trachea and bronchi. In the series of cases reported, the infection of the respiratory tract played an important part in defeating the cure of the asthma which, when treated bronchoscopically, was greatly improved. He believes that uncontaminated specimens of bronchial secretion can be secured only by bronchoscopic aspiration.

The excellent results which followed bronchoscopic aspiration of secretion in selected cases of asthma led Moore [8] to conclude that defec-

6. Cassidy, M. A.: Case of Abscess of Lung Treated by Bronchoscopic Aspiration and Lavage, Proc. Roy. Soc. Med. (Clin. Sec.) **18**:14 (April) 1925.

7. Lukens, R. M.: Bronchoscopy in the Treatment of Asthma. Observations on Twenty-One Cases, Laryngoscope **35**:227 (March) 1925.

8. Moore, W. F.: Ciliary Inhibition or Destruction in Trachobronchial Asthma, Am. J. M. Sc. **169**:799 (June) 1925.

tive ciliary drainage was an important factor in the production of this condition. With the assistance of Moffit,[9] a detailed study of the bacteriologic and cellular content of the bronchoscopically removed secretion was carried out. It was found that the cilia of the bronchial columnar epithelial cells was from 18 to 20 microns in length, and as many as 480 were found attached to a cell, whereas authoritative works on histology placed this number as varying from 12 to 25 cilia to each cell. The ciliary movements occur at the rate of 6 per second, and a secondary motion which forces secretion and foreign particles from the bronchial wall into the lumen was observed. Moore further observed a basal or root process which seemed to connect the superficial layer of cells to the basement membrane. In patients with asthma, one or more of the following changes were noted in the ciliated bronchial epithelium, namely, loss of ciliary motion which produces a current, complete loss of ciliary movement, actual loss of the cilia and fatty degeneration of the cell. In conclusion, Moore believes that patients with asthma, which is associated with a demonstrable tracheobronchitis, respond best to bronchoscopic treatment. Impairment of ciliary action has been conclusively demonstrated, and its restoration, which occurs very rapidly after the removal of secretion, is imperative for lasting improvement.

PNEUMONOGRAPHY

Lung mapping is considered by Jackson [8] as the greatest aid in the localization of pulmonary disease since the development of the science of roentgenology itself. Following the use by Sicard and Forestier (1922) of lipiodol, a vegetable oil containing iodine, in the localization of spinal cord tumors, this radiopaque substance was employed by Sergent and Cottenot (1923) for roentgenographic localization of the tracheobronchial tree. In this work the lipiodol solution was instilled into the trachea through a specially devised cannula introduced through the cricothyroid membrane.

Ballon [10] believes that the ideal and only safe method of introduction of the lipiodol is by the natural route into the trachea and bronchi by means of peroral bronchoscopy. Not only does this method allow accurate instillation of the solution into any desired part of the tracheobronchial tree and its removal by aspiration if necessary, but it also permits a direct inspection of the interior of the air passages and the removal of secretion. A detailed account of the technic is given and many pneumonograms are shown. In a large series of cases, Ballon

9. Moffit, G. R.: Pathological Histology and Bacteriology in Tracheobronchial Asthma (in press).

10. Ballon, D. H.: The Injection of Lipiodol as an Aid in the X-ray Diagnosis of Bronchopulmonary Lesions Including Tuberculosis, Canad. M. A. J. **15**:995 (Oct.) 1925.

has observed no untoward effects following the bronchoscopic introduction of as much as 30 cc. of lipiodol in one patient.

In his work on thoracoplasty on tuberculous patients, Archibald [11] has found lipiodol of the utmost value to demonstrate and localize residual lesions after operation; also to demonstrate the presence or absence of bronchiectasis and cavitation in patients who come up for an opinion as to the advisability of thoracoplasty, especially when the ordinary roentgen-ray studies give no detailed information about the condition of the lung.

Burrell and Melville [12] consider the use of lipiodol as important in arriving at a decision as to whether a given case is suitable for thoracoplasty. A case is cited in which, after the usual studies were completed, it was believed that the tuberculous process was monolateral; when lipiodol was introduced into the supposedly well lung, considerable basal disease was found.

Howarth [13] prefers the bronchoscopic method of lipiodol instillation, believing this to be more certain and exact than that of intratracheal injection.

After experimenting with barium sulphate and aqueous solutions of sodium bromide and sodium iodide, Clerf [14] agrees with other writers that the bronchoscopic insufflation of powdered, dry bismuth subcarbonate (Jackson) or the bronchoscopic instillation (Ballon) of lipiodol furnishes the best known means for increasing the visibility of the tracheobronchial tree. He enumerates various indications for pneumonography which include its use in foreign body localization, in visualization and localization of pulmonary abscess, bronchiectasis and bronchopleural fistula, and in determining the extent of involvement of primary malignant growths or other infiltrating processes.

BRONCHOSCOPY IN DISEASE

Any method of examination which permits of direct inspection, and can be carried out with a maximum of safety and a minimum of discomfort, should be considered an extremely valuable and useful adjunct to medicine.

With the increasing number of cases in which diagnostic bronchoscopy is being performed, one should consider the question of contraindications to bronchoscopy as a diagnostic measure and a therapeutic

11. Archibald, E.: X-ray Demonstration of Pulmonary Changes in Tuberculosis by Lipiodal Injections, Canad. M. A. J. **15**:1000 (Oct.) 1925.

12. Burrell, L. S. T., and Melville, S.: The Value of Lipiodol in the Diagnosis of Bronchiectasis, Lancet **2**:278 (Aug. 8) 1925.

13. Howarth, W.: X-ray Films Illustrating Lung Mapping with Lipiodol in a Case of Bronchiectasis, Proc. Roy. Soc. Med. (Sec. Laryngol.) **18**:57 (Aug.) 1925.

14. Clerf, L. H.: Pneumography, Surg., Gynec. & Obst. **41**:722 (Dec.) 1925.

procedure. In discussing this matter Funk [15] refers to the skilled bronchoscopist, and states that with skilled bronchoscopy the indications for its use increase and the contraindications decrease, while in less skilled bronchoscopy the indications decrease and the contraindications increase. As important general contraindications, he enumerates aortic aneurysm, recent hemorrhage and active tuberculosis which must, of course, be considered in the individual case. Bronchoscopy is also not indicated in the moribund and in patients who have not been given a careful preliminary examination. Contraindications to bronchoscopy as a therapeutic measure include purulent pneumonia, multiple abscess formation, empyema, extensive bronchiectasis, peripherally situated abscesses, marked cardiac weakness or any other serious complication in a patient whose pulmonary lesion might indicate its use.

Age cannot be considered as a definite contraindication to skilfully performed bronchoscopy. Patterson [16] performed a bronchoscopy on a child, aged 4 months, in whom there were signs of obstructive emphysema of the right lung, suggesting partial blocking of the right main bronchus. She concludes that peroral bronchoscopy, when carefully done without anesthesia, not too prolonged and with the necessarily delicate instruments we use, is so safe a procedure, even in infants, that it may be resorted to without hesitation when the diagnostic problem calls for inspection of the interior of the trachea and bronchi.

Bowers [17] reports the case of a child, aged 7 months, who presented the signs and symptoms of bronchial obstruction with marked emphysema of the left lung. A diagnosis of congenital web stenosis of the orifice of the left main bronchus was made on the endobronchial findings.

By bronchoscopy, the diagnosis in an obscure case, a man complaining of unexplainable hoarseness and dyspnea, was cleared up by Harris and Forbes,[18] who found in the trachea a pedunculated mass which seemed to move with the respiratory air. The growth was completely removed and was reported by the pathologist as carcinoma.

By direct endoscopic methods, Imperatori [19] was able to diagnose the presence of crescentic tracheal webs that produced hoarseness and dyspnea in three patients who came under his observation. In all three, the webs were excised, using the punch forceps by the direct method.

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15. Funk, E. H.: The Contraindications to Bronchoscopy, Arch. Otolaryngol. **1**:209 (Feb.) 1925.
16. Patterson, Ellen J.: Diagnostic Bronchoscopy in an Infant Aged Four Months, Arch. Otolaryngol. **1**:629 (June) 1925.
17. Bowers, C.: Obstruction of a Main Bronchus with Report of an Unusual Case, Laryngoscope **35**:119 (Feb.) 1925.
18. Harris, T. J., and Forbes, H. H.: Carcinoma of the Trachea, Laryngoscope **35**:53 (Jan.) 1925.
19. Imperatori, C. J.: Cicatricial Stenosis of the Trachea, Arch. Otolaryngol. **1**:624 (June) 1925.

Richards [20] reports a series of cases, notably young children, brought to him because of stridorous breathing or hoarseness and dyspnea. No diagnoses had been made and it was only by direct inspection of the larynx that he was able correctly to diagnose the causative factors and to advise proper treatment.

In a series of twenty-five subjects examined by direct endoscopic methods, Looper [21] points out the fact that conditions calling for direct examinations are not rare but, on the contrary, are commonly found in the patients observed in the average practice. He agrees with other endoscopists that the laryngoscope, bronchoscope and esophagoscope should be more generally used as diagnostic aids.

Postoperative Massive Collapse of the Lungs.—Among the outstanding contributions made by bronchoscopy during the past year, a prominent place should be given to the observations recorded by Jackson and Lee,[22] which have to do with the discovery of plugs of mucus found occluding the bronchi in a case of acute massive collapse of the lung, and the rapid recovery of the patient after bronchoscopic removal of these obstructions. In reporting the case, Lee refers to a case in which the necropsy revealed blocking of a bronchus by definite plugs of organized or agglutinated purulent mucus, and he was impressed with the similarity of the findings in this case when compared with those observed before and after removal of a foreign body by bronchoscopy.

The patient observed bronchoscopically was admitted to Lee's service, with symptoms of acute appendicitis. About three days after operation, chest symptoms developed which were diagnosed as an acute massive lung collapse. On the second day after the onset of the symptoms, bronchoscopy was performed by Gabriel Tucker, who found thick, tenacious mucus in the right main bronchus and in the middle lobe bronchus, with complete plugging of the lower lobe bronchus by tenacious exudate. This material was removed with an aspirating tube. Distinct improvement was immediately noted by physical examination and by roentgen-ray studies of the chest. After four days a second bronchoscopy was performed, when a decrease of the secretions present and an increased aeration of the right lower and middle lobes were found. The patient made a rapid and uneventful recovery.

In reviewing the endoscopic findings in this case, Chevalier Jackson concluded that the condition was definitely one of obstructive atelectasis, a form of lung collapse often observed in the presence of nonopaque

20. Richards, Lyman: A Year of Endoscopy, Boston M. & S. J. **193**:761 (Oct. 22) 1925.

21. Looper, E. A.: Endoscopy. Its Use as an Aid to General Diagnosis in Disease of the Throat and Thorax, Arch. Otolaryngol. **2**:350 (Oct.) 1925.

22. Jackson, Chevalier, and Lee, Walter Estell: Acute Massive Collapse of the Lungs, Ann. Surg. **82**:364 (Sept.) 1925.

bronchial foreign bodies, and he designated this form of obstruction as a stop-valve type which should not be confused with the other two types, namely, the by-pass valve obstruction and the check-valve obstruction. Obstructive atelectasis does not immediately disappear after removal of the obstruction as the collapsed lung does not immediately expand. The cause of this is not known. The authors believe that if every etherized patient was examined by roentgen ray immediately after operation, using the technic employed by Manges in the diagnosis of non-opaque foreign bodies, all three types of obstruction would often be found present.

Malignant Disease of the Lungs.—This is a condition which is difficult to diagnose in its early stages, and practically hopeless when it has assumed such proportions to permit a diagnosis by physical examination and roentgenology; this presents a field in which diagnostic bronchoscopy is often of the utmost importance. Diagnosis must be made early in the disease if there is a chance for cure by lobectomy, and the diagnosis must be positively made before either surgeon or patient would seriously consider such an extensive undertaking.

Jackson [3] reports a case of an endobronchial malignancy, in which early bronchoscopy would have given the surgeon a good chance to effect a cure by lobectomy. The writers discuss the characteristic endoscopic appearances of the infiltrative type of new growth, namely, deformity and fixity of the bronchi, and state that in the cases of endobronchial malignancy there is either a mass, nodule, ulcer or fungation, most often a nodule. With the bronchoscopic removal of tissue for histologic examination, a positive opinion can be given, and the surgeon will then have many otherwise impossible chances of cure of pulmonary malignancy.

Moses [23] reports three cases of malignancy of the lung, in which a positive diagnosis was arrived at by bronchoscopy. In two cases this was made by the endoscopic finding of bronchial deformity (Jackson) and fixity; in the third case, an endobronchial growth, tissue removed at bronchoscopy was reported as cancer by the pathologist.

ESOPHAGOSCOPY IN DIAGNOSIS AND TREATMENT

In a discussion of esophagoscopy in diagnosis, McKinney [24] reflects that diagnostic methods which enjoy the virtue of being exact are not too common in the practice of medicine, so that any procedure that may help to eliminate guesswork should have general recognition. There is a definite certainty after one has seen. He cites the histories of several

23. Moses, H. M.: Primary Cancer of the Lung, Am. J. M. Sc. **170**:102 (July) 1925.

24. McKinney, R.: The Esophagoscope as an Aid in Diagnosis, J. Tennessee State M. A. **38**:169 (Oct.) 1925.

patients complaining of indefinite and obscure symptoms in whom the diagnosis was cleared up by diagnostic esophagoscopy.

Waugh [25] shares the views held by leading esophagoscopists, that the roentgen ray is important in the early diagnosis of esophageal disease, but that the findings cannot always be absolute and should be verified by diagnostic esophagoscopy. He cites several cases of esophageal disease in which the diagnoses arrived at by roentgen-ray study were revised after esophagoscopy was done.

Localizing the source of blood in hematemesis by inferential methods is subject to a large percentage of error is the conclusion of Jackson and his co-workers,[26] especially when it is recalled that blood issuing from the mouth may come from any part of the air passages as well as from the food passages. In a series of 280 cases of hematemesis observed at the Bronchoscopic Clinic, abundant examples of the well-known errors incident to inferential diagnosis were shown, which also served to illustrate, by contrast, how a positive diagnosis can be reached in practically all cases with all the certainty afforded by direct inspection, and in suitable cases by biopsy. The authors conclude that esophagoscopy is safe because the esophagoscopist can see what is ahead of the tube mouth; that peptic ulcer of the esophagus is an overlooked cause of hematemesis and can be diagnosed only by esophagoscopy; that blood on a bougie does not indicate disease of the esophagus since blood can be brought from a normal mucosa and, further, that the cardinal rule in hematemesis with negative roentgen-ray findings should be: Follow the blood to its source by objective methods.

In dysphagia, the one common symptom of esophageal disease, Forbes [27] considers the esophagoscopist as the specialist to whom the internist and the surgeon should turn for assistance in the diagnosis and treatment. Before esophagoscopy is performed, a careful fluoroscopic study of the swallowing function, without and with an opaque mixture, should be made, and a roentgenogram of the chest taken to determine the presence of any source of external pressure. He views blind bouginage not only as a dangerous procedure, but also as a method that violates all the principles on which endoscopic procedures are based, namely, direct observation.

Imperatori [28] agrees on the necessity of diagnostic esophagoscopy as of major importance in correlating the subjective symptoms and the

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25. Waugh, J. M.: The Importance of the Early Diagnosis of Esophageal Lesions, Wisconsin M. J. **25**:115 (Aug.) 1925.

26. Jackson, C.; Tucker, T.; Clerf, L. H.; Lukens, R. M., and Moore, W. F.: Hematemesis, J. A. M. A. **85**:870 (Sept. 17) 1925.

27. Forbes, H. H.: Endoscopy of the Esophagus for Diagnosis and Treatment of Stricture, Cardiospasm and Malignant Disease, Laryngoscope **35**:391 (May) 1925.

28. Imperatori, C. J.: Esophageal Findings, Arch. Otolaryngol. **2**:441 (Nov.) 1925.

clinical findings, including roentgenologic studies, in conditions referable to the esophagus. Roentgen-ray studies of the swallowing function and the periesophageal structures give definite information and should never be omitted in a study of the esophagus, but esophagoscopy is indicated in all except exceptional cases to determine positively the pathologic conditions present. In new growth of the esophagus, a biopsy should be made if the process extends into the lumen of the esophagus. Imperatori observes that he has never seen any evil results follow a biopsy on the esophagus.

In a masterly presentation of his subject, Jackson [29] makes a plea for early diagnosis of malignant disease of the esophagus, and states that the ultimate prognosis of esophageal cancer today is as hopeless as it has always been. This he believes is due to the fact that the diagnosis is never made early, the reason being that books and medical literature stress only those diagnostic methods that are always negative early in the disease. The bougie may be mentioned as an example of this type of diagnostic means, a dangerous and inconclusive method which is dependent on inferential conclusions, and is always hopelessly late. When the time comes in which esophagoscopy shall be resorted to promptly on the appearance of certain vague and indefinite symptoms referable to the swallowing function, there is ample justification for the belief that the surgeon will cure a good percentage of patients. He is convinced that an early diagnosis can be made only by roentgen-ray examination and esophagoscopy, and, by these two methods, endoesophageal cancer can be diagnosed early and with the absolute certainty essential to obtaining the consent of a comparatively well man to an operation he may not survive. All other means of diagnosis are late, inconclusive and some of them dangerous.

Greene [30] agrees with Jackson that gastrostomy, in cases of cancer of the esophagus, results in marked improvement in the general condition of the patient, with maintenance of weight and strength if performed in the earlier stages of the disease. He further believes that, with the nutrition maintained and the esophagus placed at physiologic rest, more favorable results may be expected from irradiation, the results of which, to date, have been rather disappointing.

FOREIGN BODIES IN THE AIR AND FOOD PASSAGES

A survey of the literature of this phase of peroral endoscopy reveals the outstanding fact that accidental aspiration or swallowing of foreign

29. Jackson, C.: Carcinoma and Sarcoma of the Esophagus, Am. J. M. Sc. **169**:125 (May) 1925.

30. Greene, D. C.: Results of Treatment of Carcinoma of the Esophagus by the Combined Use of Radium Emanations and the Deep Roentgen Ray, Arch. Otolaryngol. **1**:51 (Jan.) 1925.

bodies is not peculiar to any one locality. Foreign bodies are now found where formerly none had been observed. In any large series of reported foreign body cases, instances in which the foreign body was overlooked for a long period of time will be found. The reasons underlying this may be discerned in the complete and carefully prepared presentation of Chevalier Jackson,[31] in which he reviews a series of 1,485 cases of foreign bodies in the air and the food passages, and indicates the reasons whereby over 200 cases had been overlooked for periods of from one month to thirty-six years. This paper is of the utmost clinical importance to every practitioner, in that it points out the many pitfalls that may lead to the overlooking of foreign bodies by one who fails to realize that the foreign body case is a distinct entity with which one must reckon.

The absence of a history or the failure of the physician to inquire carefully regarding the symptoms of choking or gagging was frequently a factor. As stated by Jackson, a negative history of the initial symptoms is of no importance, as the patient might be a child and could give no account of the accident. On the other hand, many cases of aspiration have been observed in adults, who, intelligent and sober, had no knowledge of its occurrence. One of the outstanding causes of failure in diagnosis is a lack on the part of the practitioner even to consider foreign body as a diagnostic possibility. He, therefore, makes no inquiries regarding the past history and, very often a clear and positive instance of choking and gagging while holding a foreign substance in the mouth, which would immediately suggest foreign body, is not related by the patient because of the fear of ridicule or of being considered neurotic or hysterical. He maintains that every patient giving a history of choking or strangling should be considered as a potential foreign body subject until the contrary is proved. Apathy on the part of the physician, who either believes that there is no foreign body present because the patient is not very ill, or if present, it should be left alone to pass spontaneously, is an additional cause of failure in diagnosis. Spontaneous expulsion of a foreign body may occur (in about 3 per cent of cases). To advise waiting is dangerous and may contribute to the overlooking of the foreign body.

The symptomless interval, that elusive period which elapses between the time of the accident and the occurrence of symptoms, has led many astray. After the initial signs, a foreign body may give rise to no symptoms for weeks, months or even years, and very often all knowledge of the initial accident has been forgotten. Here again it is important to inquire closely as to any recollection of choking, strangling or

31. Jackson, C.: Overlooked Cases of Foreign Bodies in the Air and Food Passages, Brit. M. J. **2**:686 (Oct. 17) 1925.

gagging, and to examine very carefully every patient from whom such an experience can be elicited.

Foreign bodies may be multiple and, unless there is a routine roentgen-ray examination made after as well as before its removal, an occasional foreign body will be overlooked.

The signs and symptoms of foreign bodies often simulate those of relatively common diseases such as pneumonia, bronchitis, bronchopneumonia, empyema, abscess, bronchiectasis, tuberculosis and asthma. Unless the practitioner realizes that a foreign body should be considered as a diagnostic possibility in every case of pulmonary disease, then foreign bodies in the trachea and bronchi will continue to be overlooked.

In his discussion of the diagnosis of foreign bodies in the air and food passages, McCrae [32] emphasizes the importance of considering foreign body as a possibility in diagnosis. Too often the question of foreign body is considered as a possibility so remote as to deserve little or no consideration. The physical signs and symptoms must be carefully observed and then studied, as in certain of these cases interpretation is exceedingly difficult. In the case of certain objects, such as a common pin in a bronchus, there is no obstruction, the only physical sign being limitation of expansion on the involved side. On the other hand, a foreign body may completely obstruct a bronchus; the obstruction may be partial, the action being valve-like, allowing air to enter but not to escape, or there may be variations due to secretion or to shifting of the foreign body. Tracheal foreign bodies, if migratory, often give the characteristic signs of audible slap, palpatory thud, tracheal flutter and asthmatoid wheeze, and are usually associated with dyspnea resulting from edema to the subglottic tissues. This may be confused with diphtheria. Foreign bodies of vegetal origin, especially in young children, produce a severe systemic reaction in addition to the physical signs in the chest and often suggest pneumonia or bronchitis. McCrae concludes that a foreign body should always be considered as a possibility; the physical signs should be carefully studied and observations should be frequently repeated; roentgen-ray studies should always be made, but these should in no way supplant the physical diagnosis.

Vandevere [33] reports the case of a boy, aged 8 years, who had been ill since the age of 2 years. Roentgen-ray studies of the chest revealed a tack in the left bronchus, which was successfully removed by bronchoscopy.

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32. McCrae, T.: Overlooked Cases of Foreign Bodies in the Air and Food Passages, Brit. M. J. **2**:693 (Oct. 17) 1925.

33. Vandevere, W. E.: Tack in Lung Six Years Removed by Bronchoscopy, Southwestern Med. **9**:349 (Sept.) 1925.

Gill [34] observed a woman, who for five years was treated for pulmonary tuberculosis. A roentgenogram, taken of the chest because of repeated hemoptysis, showed a shadow that later proved to be part of a tooth plate in the right bronchus. Recovery followed bronchoscopic removal. This case led Gill to reiterate the oft repeated admonition, namely, that all subjects with obscure chest signs and symptoms should receive the benefit of a roentgen-ray study.

In a review of forty cases of foreign bodies in the respiratory and food tracts, Jesberg [35] agrees that every child with atypical signs and symptoms of lung infection should be carefully examined with a view of ruling out foreign body, and he considers roentgen-ray study as an integral part of the examination.

Bones are more often found as foreign bodies in the esophagus; occasionally, however, a case of bone in the air passage is observed.

Ellen J. Patterson [36] reports the removal of a portion of rabbit rib from the bronchus of a child, aged 2 months. She comments on the surprisingly little reaction set up by the foreign body after a sojourn of twelve days, which bears out Jackson's observations "that bone is the only organic substance which does not set up a severe inflammatory reaction in the respiratory tract."

Stiles [37] reports the removal of a fragment of bone from the trachea of a child, aged 1 year, and noted the presence of a loud asthmatoid wheeze, a sign frequently observed, and of great diagnostic importance in certain tracheobronchial foreign bodies.

Woodward [38] cites the case of a child, aged 3 years, in which he successfully removed a bone from the trachea by bronchoscopy. He stresses some of the "don'ts" in foreign body cases, namely, avoidance of blind digital efforts of removal, slapping on the back and suspending by the heels.

In a report of twenty-five foreign body cases, Stiles [39] found the asthmatoid wheeze (Jackson) an important and reliable sign of foreign body in the respiratory tract. He also stresses the importance of considering every patient presenting a history or symptoms of foreign body as a case of foreign body until proved otherwise by complete diagnostic study.

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34. Gill, E. G.: Foreign Bodies of Dental Origin in the Lungs. Analysis of One Hundred and Seventeen Cases, Laryngoscope **35**:129 (Feb.) 1925.

35. Jesberg, S.: Foreign Bodies in the Respiratory and Upper Digestive Tracts, Calif. & West. Med. **23**:52 (Jan.) 1925.

36. Patterson, Ellen J.: Rabbit Rib in Bronchus of Infant. Report of Case with Bronchoscopy and Recovery, Arch. Otolaryngol. **1**:521 (May) 1925.

37. Stiles, M. P.: Bone Fragment in Trachea with Marked Subglottic Edema, Laryngoscope **34**:993 (Dec.) 1924.

38. Woodward, F. D.: Remarks on Foreign Bodies in the Air and Food Passages, Virginia M. Month. **52**:596 (Dec.) 1925.

39. Stiles, P.: Foreign Bodies in the Air and Food Passages. Observations on Twenty-five Cases, South. M. J. **18**:376 (May) 1925.

The severe form of septic bronchitis resulting from the aspiration into the air passages of vegetal foreign bodies has been designated by Jackson, Tucker and Clerf [40] as arachidic or vegetal bronchitis. That this condition is relatively common is evident from the fact that over 200 cases have been observed at the Bronchoscopic Clinic. It results from the aspiration of nut kernels, fruit and vegetable seeds or any other vegetal substance, and is most often observed in young children; since carelessness must of necessity play an important part in the occurrence of these accidents, fully one-half of them could be prevented. The diagnosis can be made by the physical signs of bronchial obstruction, the asthmatoid wheeze, the audible slap and by roentgen-ray examination of the chest. A history of choking and gagging is important; when absent, it is of no significance. In case of doubt, a diagnostic bronchoscopy is indicated. Bronchoscopic removal of the foreign body with aspiration of the secretion is the only form of treatment, and will give about 98 per cent recoveries in children aged about 2 years. The prognosis is progressively worse, directly as the length of sojourn and inversely as the age of the child.

In Richards' [41] cases of peanut in the bronchus, there was a clear demonstration of the necessity of eliciting a careful history, and to accept the initial symptoms of choking while having peanuts in the mouth as a positive indication of foreign body until proved otherwise.

Signs of bronchial obstruction alternating with those of a migratory tracheal foreign body were well demonstrated in a case of watermelon seed in the bronchus, reported by Martinez.[42] With the patient in the upright position, examination of the chest revealed signs of bronchial obstruction on one or the other side. On assuming the dorsal decubitus position, the foreign body was projected against the subglottic tissues by the paroxysms of coughing, and produced the characteristic signs and symptoms of a loose tracheal foreign body.

The diagnosis of nonopaque foreign bodies in the trachea, unless associated with the characteristic audible slap and palpatory thud described by Jackson, has often been a matter of considerable difficulty. Manges,[43] by roentgen-ray observations made in many cases of nonopaque foreign body in the trachea, has finally placed the matter of roentgenologic diagnosis on a sound scientific basis. The technic of examination is that employed by him in his work on obstructive

40. Jackson, Chevalier; Tucker, G., and Clerf, L. H.: Arachidic and Other Forms of Vegetal Bronchitis, Atlantic M. J. **28**:506 (May) 1925.

41. Richards, L.: Bronchial Peanuts and Their Problems, Boston M. & S. J. **193**:215 (July 30) 1925.

42. Martinez, E.: Foreign Bodies in the Tracheo-Bronchial Tree, Rev. de Med. y ciruj. de la Habana **29**:639 (Dec.) 1924.

43. Manges, W. F.: Roentgen-ray Diagnosis of Nonopaque Foreign Bodies in the Trachea, Am. J. Roentgenol. **13**:429 (May) 1925.

emphysema. The outstanding changes observed are obstructive emphysema of both lungs with depression of both sides of the diaphragm, and rotation of the heart with diminution of its transverse diameter at expiration. This diminished diameter can be definitely ascertained by actual measurements of the heart shadow on films exposed at the end of inspiration and of expiration. Corroborative evidence of a tracheal foreign body is occasionally observed when a temporary obstructive emphysema occurs in either lung, due to slight movement of the foreign body. By this method Manges has repeatedly made a positive diagnosis of nonopaque foreign body in the trachea, which was subsequently corroborated by bronchoscopy.

The importance of accurate interpretation of the roentgen-ray findings in cases of nonopaque foreign bodies is stressed by Mathers.[44] The unobstructed lung, when contrasted with the opposite emphysematous lung during expiration, may give the impression that there is a partial collapse present.

Difficulty may be met with in the diagnosis of nonopaque esophageal foreign bodies, as fish bones and similar substances, which, by their small size and location, may not produce sufficient obstruction of the esophageal lumen to hinder the downward progress of an opaque mixture or bismuth-filled capsule used for roentgenographic study. In such a case, Tucker [45] discovered a new sign which he often has found useful as a diagnostic measure. It is elicited by moving the trachea or larynx toward the point of localized tenderness, which will cause a marked increase in pain and tenderness at this point if a foreign body is present. If no foreign body is present, little or no change in the tenderness will be noted.

According to Jackson, "the endoscopic extraction of a foreign body is a mechanical problem, pure and simple, and must be studied from this point of view."

Kelley [46] reports the case of a common pin in the right upper lobe bronchus, which presented difficulties that appeared to be insurmountable. By working out the mechanical problems on the cadaver, he was able successfully to remove the pin with the aid of a Lynah aspirating tube.

In a discussion of the safety-pin problem, Meyers [47] agrees that every case should be carefully studied from every angle before making any attempt at removal.

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44. Mathers, R. P.: Two Cases of Vegetable Foreign Body in the Bronchus, J. Laryngol. & Otol. **40**:24 (Jan.) 1925.

45. Tucker, Gabriel: Retropharyngeal Abscess from Lodgment of a Foreign Body in the Esophagus, J A. M. A. **84**:511 (Feb. 14) 1925

46. Kelley, I. D.: Mechanical Problem of the Bronchoscopic Removal of a Pin from the Right Upper Lobe Bronchus Under Fluoroscope. Report of a Case. Ann. Otol., Rhinol. & Laryngol. **34**:819 (Sept.) 1925.

47. Meyers, E. L.: Safety Pins in Food and Air Passages; Report of Two Cases, J. Missouri State M. A. **51**:96 (March) 1925.

A statistical compilation of valuable data, relative to foreign bodies in the air and food passages, has been prepared by Tucker and Clerf [48] in a form identical with the charted experiences reported by Chevalier Jackson in 1924. This includes all the cases of foreign bodies that have come to the Bronchoscopic Clinic since Jackson's previous report, that is, from FBDY. 1,155 to FBDY. 1,400. Many of the cases (about 20 per cent) were complicated by instrumentation previous to admission to the clinic, which often served to complicate the mechanical problems and to increase the mortality rate.

A matter of outstanding interest to all endoscopists who work out the technic of endoscopic procedures and the mechanical problems of removal of foreign bodies on the dog, is the fact that veterinarians are now using bronchoscopy and esophagoscopy on the dog as a patient. If any justification was called for in the use of the dog as a subject in this work, it most certainly could be furnished, since the dog is now receiving the benefit of the technic developed by experimental work on him. Horning and McKee [49] refer to cases of foreign body, and cases of disease in dogs and cats dealt with by bronchoscopy and esophagocopy.

NEW INSTRUMENTS

A number of new instruments have been mentioned in the literature. Noteworthy among these are an esophagoscope by Shekter [50] and one by Kosokabe,[51] a retrograde laryngoscope by Tucker [52] and a laryngostat by Jackson, Tucker and Clerf.[53] Tucker and Clerf [54] have devised a ball forceps and Tucker [55] a staple forceps. Lukens [56] and Clerf [57] have each contributed a specimen collecter. Moore [58] devised

48. Tucker, G., and Clerf, L. H.: Foreign Bodies in the Air and Food Passages, Ann. Otol., Rhinol. & Laryngol. **34**:5 (March) 1925.

49. Horning, J. G., and McKee, A. J.: Endoscopic Work on Dogs and Cats, Veterinary Med. **20**:206 (July) 1925.

50. Shekter, A. J.: A New Endoscope for Closing Safety Pins, Arch. Otolaryngol. **1**:643 (June) 1925

51. Kosokabe, H.: New Esophagoscope for a Flat Foreign Body, Arch. Otolaryngol. **2**:458 (Nov.) 1925.

52. Tucker, Gabriel: Retrograde Laryngoscope, Am. Otol., Rhinol. & Laryngol. **34**:774 (Sept.) 1925.

53. Jackson, Chevalier; Tucker, G., and Clerf, L. H.: Laryngostasis and the Laryngostat, Arch. Otolaryngol. **1**:167 (Feb.) 1925.

54. Tucker, G., and Clerf, L. H.: A Bronchoscopic Forceps for Balls, Marbles, Beads and Other Hard Globular Objects, Laryngoscope **35**:175 (Feb.) 1925.

55. Tucker, G.: A Bronchoscopic Double Point Grasping Staple Forceps, Ann. Otol., Rhinol. & Laryngol. **34**:772 (Sept.) 1925.

56. Lukens, R. M.: Bronchscopic Specimen Collector, Laryngoscope **35**:717 (Sept.) 1925.

57. Clerf, Louis H.: A Bronchoscopic or Esophagoscopic Specimen Collector, Laryngoscope **35**:550 (July) 1925.

58. Moore, W. F.: Bronchial Flexible Aspirator, Laryngoscope **35**:623, (Aug.) 1925.

a flexible bronchial aspirator, Lukens [59] a bronchoscopic syringe, and Clerf [60] a bronchoscopic powder insufflator. Iglauer [61] has made up a new valvular tracheal cannula and Mandelbaum [62] has contributed a lamb's lung manikin for bronchoscopic study and practice.

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59. Lukens, R. M.: Bronchoscopic Syringe, Laryngoscope **35**:716 (Sept.) 1925.

60. Clerf. L. H.: A New Bronchoscopic Powder Insufflator, Laryngoscope **35**:482 (June) 1925.

61. Iglauer, Samuel: A New Valvular Tracheal Cannula, Arch. Otolaryngol. **2**:58 (July) 1925.

62. Mandelbaum, M. J.: Lamb's Lung Manikin for Bronchoscopic Study and Practice, Arch. Otolaryngol. **1**:533 (May) 1925.

News and Comment

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

The Pacific Coast Oto-Ophthalmological Society holds its annual meeting in San Francisco, April 26, 27 and 28, 1926. The American Board of Ophthalmic Examinations and the American Board of Otolaryngology plan to hold examinations in San Francisco in conjunction with this meeting. Those desiring to take these examinations should write immediately to Dr. W. H. Wilder, 122 South Michigan Avenue, Chicago, secretary of the Ophthalmic Board, or to Dr. H. W. Loeb, 1402 South Grand Boulevard, St. Louis, secretary of the Board of Otolaryngology.

AMERICAN BOARD OF OTOLARYNGOLOGY

An examination will be held by the American Board of Otolaryngology in Dallas, Texas, on Monday, April 19, 1926, and in San Francisco, California, on Tuesday, April 27, 1926. Applications should be made to the Secretary, Dr. H. W. Loeb, 1402 South Grand Boul., St. Louis, Missouri.

ANNUAL MEETINGS

The American Laryngological, Rhinological and Otological Society will hold its annual meeting at the Mount Royal Hotel, Montreal, Canada, May 31 to June 2, inclusive. President, Dr. John M. Ingersoll, Cleveland, Ohio; Secretary, Dr. Robert L. Loughran, 145 West 58th St., New York City.

The American Otological Society will hold its annual meeting at the Mount Royal Hotel, Montreal, June 2 and 3, 1926. President, Dr. Thomas J. Harris, New York City; Secretary, Dr. D. Harold Walker, 390 Commonwealth Avenue, Boston.

The American Laryngological Association will hold its annual meeting at the Mount Royal Hotel, Montreal, Canada, June 3 to 5, 1926, inclusive. President, Dr. Greenfield Sluder, St. Louis; Secretary, Dr. George M. Coates, 1811 Spruce Street, Philadelphia.

LOCAL SOCIETY MEETINGS

BALTIMORE: The Section on Otology and Laryngology, of the Baltimore City Medical Society, meets on the last Friday of each month, at 1211 Cathedral Street, at 8:30 p. m. Chairman, Dr. Sylvan Rosenheim; Secretary, Dr. Edward A. Looper.

CHICAGO: Chicago Laryngological and Otological Society meets on the first Monday of the month from October to May at the Crystal Room, Great Northern Hotel. Chairman, Dr. E. H. Norcross; Secretary, Dr. A. A. Hayden, 25 East Washington Street.

CLEVELAND: Ophthalmological and Otolaryngological Section of Cleveland Academy of Medicine meets on the fourth Friday of each month at the Winton Hotel. Chairman, Dr. E. W. Garrett; Secretary, Dr. M. Paul Moto, Rose Building.

DENVER: The Colorado Oto-Laryngological Society meets on the first Saturday of the month from October to May, at the Assembly Room, Metropolitan Building. President, Dr. William C. Bane; Secretary, Dr. C. Howard Darrow, Metropolitan Building, Denver.

KANSAS CITY, MO.: Kansas City Eye, Ear and Nose Society meets on the evening of the third Thursday of each month from September to May, at the Baltimore Hotel. The afternoons of the third Thursday of November, January and March are given over to clinical work. President, Dr. James May; secretary, Dr. A. E. Eubank.

MILWAUKEE: Milwaukee Oto-Ophthalmic Society meets on the third Tuesday of the month, at the University Club, at 6:30 p. m. President, Dr. John E. Guy; Sec.-Treas., Dr. John J. Brooks, Majestic Building.

NEW YORK: Otological Section of New York Academy of Medicine meets on the second Friday of each month from November to May, at 17 West 43d Street. Dr. James Morisset Smith, Chairman; Dr. J. L. Maybaum, 12 East 86th Street, Secretary. Laryngological and Rhinological Section of New York Academy of Medicine meets on the fourth Friday of the month from November to May, at 17 West 43d Street. Otolaryngological Section of the Kings County Medical Society meets on the second Wednesday of January, March and May, at 1313 Bedford Avenue, Brooklyn. Chairman, Dr. Harry Meyersberg; Secretary, Dr. Charles Breitman, 210 Brooklyn Avenue, Brooklyn.

PHILADELPHIA: Section on Otology and Laryngology of the College of Physicians of Philadelphia meets on the third Wednesday of each month from October to June, at 8:30 p. m., at the College of Physicians. Chairman, Dr. Fielding O. Lewis; Secretary, Dr. James A. Babbitt, 2117 Chestnut Street.

Abstracts from Current Literature

Ear

THE CURABILITY OF SEPTIC PURULENT MENINGITIS OF OTITIC ORIGIN. MALOENS, Rev. de laryngol. **46**:717, 1925.

After considering the surgical treatment of the middle and internal ear and its adnexa, this investigator advocates liberal lumbar puncture repeated often, together with serotherapy and vaccine therapy.

Chemotherapy by intra-arachnoid injections is advised, and systemic medication with hexamine, which he considers is the best medication to be used. He considers the various therapeutic measures such as collargol, lysol, sodium salicylate and potassium iodid and iodoform. He quotes Crowe as saying "that hexamine administered by the mouth can be detected in the arachnoid spaces in from thirty to sixty minutes after it is administered." It inoculates the cerebrospinal fluid and inhibits the development of micro-organisms.

Maloens decries the attempt to treat the arachnoid spaces via the spinal canal, and thinks the blood stream the route of attack for infection in the meninges.

In his conclusion he says:

1. Every one is in accord with the utility of copious evacuations of the cerebrospinal fluid, which produces, (*a*) decompression of the central nervous system, bringing a relief of the internal cerebral and bulbar blood circulation which, if not relieved, will cause metabolic changes in the form of acidosis and auto-intoxication producing asphyxia and disorganization of the nervous elements; (*b*) eliminating as much as possible infection and destructive toxins; (*c*) encouraging the formation of fresh cerebrospinal fluid as a true lavage to the arachnoid spaces; (*d*) the encouragement of a maximum quantity of blood antibodies, antiseptics and autotoxins medicinally.

2. Among these medications, hexamine is recommended (formic iodid), as it is a valuable agent by reason of the rapidity of its diffusibility in the whole economy, its intense action and absolute innocuity.

3. Chemotherapy by the intravenous route.

4. Injections into the spinal canal is rejected as useless.

5. Local applications of hexamine in operative wounds.

He reports the recovery of a woman, aged 29, who had purulent meningitis following an acute attack of labyrinthitis.

TREATMENT OF OZENA BY PEREZ VACCINE. GEORGES PORTMANN, Rev. de laryngol. **46**:741, 1925.

Of twelve patients treated, most of them had only vaccination by the Perez-Hofer treatment with no intranasal lavage. The patients were five males and seven females, who varied in age from 15 to 28. Of these, two obtained a clinical cure; eight were ameliorated in symptoms; two were not benefited at all.

In the two cases clinically cured, one was a man, aged 27, who had crusts in the nasal cavity but no pus. The mucous membrane was shiny but no odor was present.

In a woman, aged 28, the nasal fossae were atrophied, but the mucous membrane was rose colored and moist with some crusts and odor.

In two patients, one a girl, aged 17, the other, a man, aged 20, the treatment made no change in their condition. In the eight other patients the amelioration of symptoms varied. The first manifestation was the loss of the odor, which in some was gone completely, while in others it was still present. The crusts were softer, more easily expelled and did not occur so frequently.

Portmann is not enthusiastic over the treatment, but thinks it should be tried in cases in which it is indicated.

ROBERTSON, Chicago.

METHOD OF INVASION OF POSTERIOR FOSSA IN OTITIS MEDIA. F. FREMEL, Monatschr. f. Ohrenh. **59**:400 (No. 4), 1925.

Three courses are generally recognized: (1) preformed route, wherein bony plate, meninges and brain cortex separate the middle ear from brain abscess; (2) direct invasion of infection from middle ear through the structures before mentioned, the usual method; (3) metastasis through the blood circulation.

Körner calculates 42 per cent by the direct invasion. In forty cases of cerebellar abscess, there were two instances when the bone separating the middle ear from the abscess was normal in appearance. Hencke in twenty-four cases found three such instances. Blau collected 737 brain abscesses in literature, forty of which showed macroscopically no direct invasion of the brain. The authors concluded, therefore, that the intracranial complication was metastatic. This connot be inferred unless microscopic examination of the intervening bony wall and meninges is made.

Kümmel, Hinsberg, Miodowski and Karl Beck reported histologic studies, demonstrating the invasion of the cranium through preformed channels; in the case of cerebellar abscess the route is through the labyrinth, sigmoid sinus, posterior antral wall or the hiatus subarcuatus. The last named is a small dell on the posterior surface of the petrous bone, lateral to the internal auditory meatus near the apex of the pyramid. A process of the dura is firmly attached to this spot, which, though quite prominent in the child's skull, in the adult's becomes much shallower or even obliterated.

Fremel reports two cases of cerebellar abscess in which serial, microscopic study disclosed a direct, progressive invasion of the brain. Whether a meningitis or an abscess results after such an invasion depends apparently on the resistance of the dura (in addition to other factors, such as virulence of the organisms, duration of the middle ear suppuration). If the process reaches the dura and remains intradural for a time, permitting a firm adherence of the dura to both bone and brain cortex, further extension results in an abscess. Rapid extension through the dura does not afford the opportunity of dural adhesion and results thereby in a diffuse meningitis.

MORPHOLOGY OF CEREBELLAR ABSCESS. F. FREMEL, Monatschr. f. Ohrenh. **59**:710 (No. 7), 1925.

Adding three more cases of cerebellar abscess to the first series of three (*Monatschr. f. Ohrenh.* **7**, 1923), Fremel calls attention to the position and shape assumed by the abscess. Cerebellar abscess complicating a chronic otitis media was suspected in all the cases; exploratory puncture of the brain, however, failed to strike the abscess. The latter extended from one half to two thirds of the distance from the anterior lobule to the postero-inferior lobule of

the cerebellum. As a rule, it rested directly under the cortex, and, though not distinctly lobulated, it often conformed to the outlines of the ramifications of the arbor vitae in the cortical layer.

Illustrations demonstrate the long, narrow outline of the abscess with its many irregular outpouchings and deep extension posteriorly, factors which account for the frequent negative punctures of the cerebellum and also the unsatisfactory drainage.

GLOWACKI, Detroit.

Pharynx

PARALYSIS OF THE EPIGLOTTIS. H. MARX, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:111 (Oct. 30) 1925.

There is little known about the pathologic disturbances of the function of the epiglottis. A man, aged 51, complained of a cough which had been claimed to be a nervous cough. The laryngoscopic examination showed that both valleculae were filled with white foam. Some foam was also found in the sinus pyriformis. When the patient drank water or milk, some fluid remained in the valleculae. During phonation of high sounds, the epiglottis was raised in a normal manner. The sensitiveness of the oral cavity and of the pharynx and larynx were normal. Transillumination with the roentgen ray showed that small quantities of contrasting fluid, when swallowed, remained in the valleculae. The epiglottis did not turn backward but remained upright. The larynx was not pushed, as is done normally under the base of the tongue, and did not raise normally, so that the hyoid bone remained about at the height of the third cervical vertebra. In further efforts at swallowing, the material was pushed into both sinus pyriformes, where it remained. Disturbances of pupillary reaction, absence of the achilles tenden reflexes, increased patellar reflexes, a positive Romberg sign and disturbance while walking, pararthria syllabaris, hardness of hearing due to affection of the nerve, disturbance of memory and perception, great emotional disturbance and bronchopneumonic foci in both lower lobes were present. The Wassermann reaction was negative. The internist and neurologist diagnosed beginning taboparalysis. The investigations of Moritz Schmidt, Schmelzer and others and the roentgen-ray examinations by Scheier, Eykmann, and Kuepferle have shown that the old view that the epiglottis is pushed over the entrance of the larynx is correct. This movement is a passive one. When the larynx moves upward and forward, the epiglottis is pushed downward. It can scarcely be assumed that the scant muscles of the epiglottis, the thin muscle fibers of the interarytenoideus obliquus, the thyro-epiglotticus and the fibers of the stylopharyngeus can have such a powerful effect. The conditions are, furthermore, complicated by the fact that the muscle system is doubly innervated from two different nerves. The stylopharyngeus is innervated, as Rethi has shown, by the glossopharyngeal nerve, whereas the others are innervated by the recurrent nerve. A completely satisfactory explanation cannot be furnished in this case. It can safely be assumed that a tabetic nuclear paralysis in the medulla oblongata is present, and that the nuclei which are of importance for the movements of the epiglottis are situated near each other and can become diseased singly. A similar case has not yet been observed, but it is possible that especially careful roentgen-ray examinations of the act of swallowing in diseases of the central nervous system may show such disturbances of movement of the epiglottis more frequently.

AMBERG, Detroit.

Larynx

DULL INJURY OF THE LARYNX BY STRANGULATION. KARL HELLMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:115 (Oct. 30) 1925.

In November, 1923, a man, aged 27, accidentally became caught in loose rope that became wrapped around his neck when an iron plate was hoisted. He suffered from strangulation, and became immediately unconscious. He was quickly liberated and when admitted to hospital was suffering from severe dyspnea. A tracheotomy was not considered necessary. The expectoration was slightly hemorrhagic, and the patient could not swallow and was nourished with the aid of a tube. Thirteen days after the accident, a laryngoscopic examination showed a pronounced swelling of the false cords with an injury of the left. The vocal cords could not be seen. The voice had not suffered much, and the swelling receded. In February, 1925, the patient was again referred to the clinic on account of severe difficulty in breathing. The entrance of the larynx was covered by a membrane. This membrane ascended from the epiglottis to the wall of the pharynx. In the middle of the membrane, an oval opening of the size of a small bean was found. The left vocal cord could be seen through this opening. Mushy food could easily be swallowed. On account of the bad general condition and grave changes of the heart, surgical interference was not resorted to. The patient was sent to the medical clinic for treatment of his heart trouble, but he died after five weeks. So far as the larynx was concerned, necropsy showed that the epiglottis in its lateral parts was bent toward the rear and the middle. The largest portion of the interior of the larynx and the aryepiglottic folds could not be seen from above, because a thin membrane was spread diagonally over the entrance of the larynx. The membrane showed several cicatricial bands. The region of the arytenoid cartilage was normal. Fracture lines could not be felt on the cartilaginous portions of the larynx. The epiglottis was lying extremely high over the entrance to the larynx. The other parts of the larynx seemed to be pushed downward from the epiglottis. The distance from the upper border of the epiglottis to the vocal cords was 6.2 cm. The carotid artery at the height of the fissure of the thyroid cartilage on the right side, showed a threadlike bridge in the lumen. To the extent of 4 cm. upward, changes of the vessel wall could be noticed which were of a streaky, uneven and furrowed nature. The lumen was dilated, the vessel wall felt thickened and tough. On the left side, the intima of the carotis ceased abruptly at the height of the middle of the thyroid cartilage, and formed a small circular ridge. Like on the other side, the carotid artery was dilated upward. The lining of the wall was uneven, with small conelike tough prominences. The changes reached to the origin of the internal carotid, just as on the other side.

Three points were of particular interest in this case. First, the nature of the injury; second, the course; third, the consequences concerning the larynx and other organs. The retrograde amnesia, which is frequently found in hanging with suicidal intent, was entirely missing in this patient. He could give correct information until the moment when he became unconscious. This perhaps can be explained by the fact that in an accident, the mind remains normal until the last moment, whereas it is more or less disturbed in people who commit suicide.

HYPERKERATOSIS CIRCUMSCRIPTA LARYNGIS. KARL STAMM, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:129 (Oct. 30) 1925.

The patient was a man, aged 60, whose mother had died of cancer of the liver. He had undergone an operation for cancer of the skin in the region

of the groin in May, 1924. Four months previously, he had a stroke of apoplexy, which had left him with a moderate paresis of the right leg and arm. The disease of the larynx began ten months previously with hoarseness. On admission, it was found that the anterior third of the right vocal cord showed a slight thickening and redness. On the lower border a nodule the size of a pinhead was found. It was snow white and showed an indented surface. The nodule was removed with a punch. The voice became clearer, and the complaints became less. A detailed description of the microscopic specimen follows. This showed a transformation of the normal epithelium of the vocal cord, at a circumscribed spot, into a tissue which resembled, at the first look, a hairless epidermis with a thick horny layer.

This anomaly of the mucous membrane has been described in the literature by various names, such as, pachydermia glabra (Zenker), cornu laryngeum (Jurasz), keratosis laryngis (Juffinger), etc. The main object of therapeutic efforts is the prevention of a recurrence.

Heryng recommended removal of the growth, the use of astringents and rest of the voice for several months. Blumenfeld advocated local application of a 3 per cent nitrate of silver solution. Juffinger advised treatment with a 10 per cent salicyl alcohol solution, a remedy which also proved satisfactory in a very obstinate case to Fein. In obstinate cases of papillomatosis of the larynx, sometimes an application of a concentrated iron chloride solution proved useful (v. Stein). This remedy, with arsenic internally, might be tried in conditions which are hard to be influenced.

1. The hyperkeratosis circumscripta laryngis is a process of transformation of the epithelium of the vocal cord into a tissue which resembles a hairless epidermis at a circumscribed spot. The cause is unknown. The excessive cornification of the uppermost layers is the most significant symptom. Therefore, the name "hyperkeratosis circumscripta laryngis" appears to be the most appropriate.

2. It is necessary to differentiate from this circumscribed hyperkeratosis (*a*) the more frequent diffuse hyperkeratosis of the larynx; (*b*) the larger white tumors of the larynx (Rosenberg); (*c*) the "leukokeratoses" or leukoplasias of the larynx in psoriasis and itchthyosis.

AMBERG, Detroit.

Nose

ATROPHIC CORYZA NOT OZENA, DUE TO A POSSIBLE DEGENERATION OF THE SPHENOPALATINE GANGLION. I. A. SOUCHET, Rev. de laryngol. **46**:757, 1925.

Souchet mentions two cases of atrophic rhinitis following a trigeminal paralysis, reported by Worms. One of these was traumatic in origin, while the other was due to some form of infection.

Another case was reported one year later by M. M. Reverchon and Worms, which was caused by a war wound in the right pterygomaxillary region. This case was attended by atrophic rhinitis of the type of ozena. These conditions, he thinks, develop in many cases from wounds which affect the lachrimal and salivary glands. With a nasal secretion, mucopurulent or purulent in character, localized in the nostril characteristic of ozena, accompanied by salivary or lachrimal disturbance or when there is anesthesia of the soft palate, gums, teeth, inside of the face, with gustatory anesthesia of the half of the tongue.

According to Souchet, these conditions make one think of a lesion of the sphenopalatine system.

He reports a case of a woman, aged 38, who had not been able to smell for eighteen months, and who complained of having had a dry nose all her life. She had never had a bad odor from her nose, never had formation of crusts, and never had pus from the nose or throat. This statement was confirmed by her husband. The rhinoscopic examination revealed an extreme degree of atrophy of the external walls. The inferior turbinals were hardly visible, while the middle and superior turbinals were reduced to a thin, gristly band. The nasal fossae were considerably enlarged, showing a pale and glistening mucous membrane. There were no ulcerations, crusts or purulent masses present. The nasopharynx was pale and varnished in appearance, with a lack of sensibility, which was also absent in the nose. There was entire absence of odor at the time of the examination. The annexed cavities of the nose were negative.

The patient's health was excellent, with no trouble such as tuberculosis or syphilis either hereditary or acquired, and no other member of her family had ever suffered from nasal disease. Her Wassermann reaction was negative.

Of 217 cases of atrophic rhinitis, this was the only one which showed no ozena. Souchet states that specialists divide this disease into two types, one attributed to a purely microbic origin, the other to an anatomic cause in an enlarged nasal fossa from a lesion of the sphenopalatine system of nerves. He quotes Worm and Reverchon in saying "following a lesion of the trigemina and particularly of the sphenopalatine system, the mucous membrane may present lesions which in a symptomatic way resemble the clinical picture of ozena if not identified with it. All observations speak in favor of the trophic theory of ozena.

"Is it not logical to conclude that, in the beginning of this condition, the essential element may be secondary and intervening when a favorable site is prepared by a nervous trouble?"

Souchet suggests that the presence of microbic toxins such as tuberculosis, syphilis or otherwise in the blood of the patient, which may be undiscovered in habitual examinations, may fix on the sphenopalatine system and may be the point of origin of the trophic troubles presented by the pituitary membrane.

Such lesions are comparable with the reports observed in muscular atrophy, troubles of the skin, etc., which are consequent to an intoxication by poisonous microbes of nervous fibers of the trophic cells.

The absence of malodor and crusts, which give ozena its characteristic clinical aspect, seems to give proof in favor of the individualization of trophic trouble, and sustains the theory of the exogenic origin of the secretions which affect the unfortunate subject with ozena.

This author does not think our present knowledge quite sufficient to establish fixed reasons for this condition, but hints it may be due to poor hygiene during the early period of life.

ROBERTSON, Chicago.

AN INTERESTING CASE OF CHRONIC SUPPURATIVE ETHMOIDITIS WITH PREDOMINATING OCULAR SYMPTOMATOLOGY. GINO MERELLI, Riv. oto-neuro-oftal. **2**:356-361 (July-Aug.) 1925.

Merelli reports a case of a man, aged 45, who, two years previously without any apparent cause, began to have pain at the inner angle of the left orbit, with an external displacement of the left eye, causing diplopia. This state of affairs lasted for about a week and disappeared spontaneously. He felt well for fifteen days when the identical conditions before described returned, this attack lasting for about ten days. Since then, this symptomatology has been repeated at periods of from fifteen to thirty days, with each attack lasting

from ten to twenty days. He consulted various ophthalmologists, who diagnosed a probable tumor of the orbit. At no time did the patient have any fever, discharge of pus from the nose or any feeling of fulness in the nasal cavities. Recently, the patient was seen by Professor Anselmi, who examined him, and, suspecting that the disturbances could be caused by a lesion of the corresponding ethmoid cells, referred him to the author for examination.

At this time the patient was in a state of good health, the last attack having been fifteen days previously and all over after ten days. The patient, on examination, stated that he had completely lost the sense of smell in the left side of the nose, and that he had noticed during the attacks of diplopia a certain dimness of vision in the left eye and that he had for about a week a slight mucopurulent discharge from the nose.

Examination showed the right nasal cavity perfectly normal. The left nasal cavity presented a reddened mucosa throughout and especially over the left middle turbinate. The left inferior turbinate was slightly larger than normal on account of edema of the mucosa. The head of the left middle turbinate appeared definitely enlarged and assumed a globular aspect; in the anterior part of the left middle meatus a small quantity of mucopus was present. Pressure exerted externally on the classic points corresponding to the frontal and maxillary sinuses caused pain. Digital pressure on the lacrimal bone (Grünwald's sign) caused intense pain. The right orbit and its contents were normal. The left orbit and its contents appeared normal on external inspection. There was no edema or injection. Ophthalmic examination by Professor Anselmi at that time did not show any lesion involving the visual apparatus. On transillumination, both maxillary sinuses were equally transparent. The left frontal was much less transparent than the right.

Roentgenographic examination showed an intense opacity of all the ethmoid cells on the left side, and an opacity of moderate grade of the left frontal sinus. The anterior group of ethmoid cells were somewhat more obscure than the posterior group. The sphenoids were normal.

Intranasal operation was decided on. This consisted of removal of the head of the left middle turbinate, curetting the anterior ethmoid cells, which contained an abundance of pus and granulations, and also curetting the posterior ethmoid cells, where, besides pus and granulations, there was edema of the mucosa. The postoperative course was uncomplicated. Roentgenographic examination made some days later showed the disappearance of the clouding of the left ethmoid cells and the left frontal sinus.

The patient was seen about four months after operation, and stated that he had had no return of the symptoms which he had had before operation.

The author, in discussing this case, mentions the recent report to the French Society of Oto-Rhino-Laryngology by Canuyt, Ramadier and Velter, who divided the symptoms which should call one's attention to posterior nasal sinus disease into ocular symptoms, painful symptoms and reflex symptoms. Of the ocular type they distinguished:

1. Those which develop as peculiar to the muscles of the eye.
2. Those which determine a choroiditis or a chorio-retinitis.
3. Those which develop as peculiar to the optic nerve.

The author mentions the anatomic relations between the orbit and the ethmoid cells, and that the weakest point in the wall is over the lacrimal bone so that the direct extension of ethmoid infection is possibly into the orbit, and at other times, on account of the lymphatic and vascular communications between the ethmoid and mucosa and loose tissue of the orbit, inflammatory

edematous conditions result which can cause, along with abscess and phlegmons, external and downward displacement of the eyeball.

The author's conclusions are:

1. When there exists inflammatory alterations of the orbit, it is always well that the oculist consult with the rhinologist.

2. It is demonstrated that a purulent inflammation of the ethmoid cells, especially of the anterior cells, can spread to the soft tissues of the orbit.

3. Whenever possible, it is wise to have recourse to the most simple operative methods, reserving the more complex and radical procedures when the result of the first operation has not been entirely satisfactory.

H. H. Vail, Cincinnati.

Hypophysis Operation. A. Lautenschlaeger, Ztschr. f. Hals-, Nasen-u. Ohrenh. **13**:104 (Oct. 30) 1925.

The sphenoidal cavities are best opened through the respective maxillary antrums. Jansen was the first to do this. Studies on the cadaver convinced Lautenschlaeger that the sella turcica could be reached through the maxillary antrum by luxation of the lateral nasal wall, bending of nasal septum and breaking of its posterior part. By these means the wall between the sphenoidal cavities is laid bare and can be removed, so that the sphenoidal cavity of the other side also becomes accessible. It is not necessary to sacrifice the whole lateral nasal wall with the middle and lower turbinates, as Denker and Fein do. Denker had recommended the premaxillary way in 1921.

Lautenschlaeger operated on a girl, aged 12 years, in January, 1924. She had suffered from loss of vision in the left eye, and from temporal hemianopsia in the right eye. The papillae were normal. The pupil of the left eye did not react to light; the right did. Fingers could be counted with the right eye at a distance of 3 to 4 meters. The roentgenogram showed an overdeveloped sella turcica. The patient suffered from diabetes insipidus and bilateral chronic middle ear suppuration. The hypophysis operation was performed under local anesthesia, combined with chloroform. The entire facial wall of the maxillary cavity and a part of the adjoining processus frontalis were removed in the usual way without exposure of the apertura piriformis. The edematous thickened mucous membrane of the maxillary antrum was removed, and the medial wall of the maxillary cavity was broken with the handle of the hammer and pushed toward the middle. By strong pressure on the nasal septum, free access was obtained to the ethmoid cells, which were also covered with a thickened mucous membrane. They were removed by chisel, conchotome and curet. The passageway from the maxillary antrum to the ethmoid cells was freely exposed. The left sphenoidal cavity, a natural continuation of the posterior lower ethmoid cell, was opened and its inflamed mucous membrane was removed. Then the nasal septum could be broken in its upper posterior portion and pushed toward the right side in the same manner as the medial wall of the maxillary antrum. After removal of the wall between the two sphenoidal cavities, the whole posterior wall of the sphenoidal cavity was plainly visible. This was done in a few minutes, almost without any bleeding. The osseous channel for the optic nerve could be seen at the lateral wall of the opened sphenoidal cavity. Medially and below this ridge, the thickened osseous wall was chiseled open like a circle with a gouge which was slightly bent. This piece was carefully lifted from the posterior wall of the sphenoidal cavity. From this circular

opening further portions were removed after pushing the dura away until a comfortably broad opening presented itself. Then the dura covering the hypophysis was opened. The grayish red and slightly uneven substance of the hypophysis pushed itself into the opening, and was carefully removed with a sharp spoon. The opening was packed and all opened accessory cavities were loosely filled with iodoform gauze. No hemorrhage and no rise in temperature occurred. The first dressing was done on the sixth day, but the packing in the sphenoidal cavity was left in place. This was removed three days later under slight anesthesia. At the same time the lateral nasal wall was put back in its place and a communication established between the lower nasal meatus and the maxillary cavity. Again, a packing was applied. This was left in place for five days and was not renewed. The cavity made by the operation became smaller but remained open to an extent that a radium capsule could easily be introduced into the sphenoidal cavity.

This operation can be performed from both sides. It is advisable to choose the side on which the nasal cavity is wider in consequence of a deviated septum. Spurs and swollen turbinates in the lower meatus are of no consequence, but osseous swelling of the middle turbinate may prove disturbing, and make the other side the choice. In nasal and transseptal methods, respectively, the distance from the nose to the posterior wall of the sphenoidal cavity is from 8 to 10 cm.; from the border of the wound of the upper maxilla to the same place it is only from 5 to 6.5 cm. in the adult, and less in a child. This shorter route is of great advantage, especially when the anterior wall of the sella turcica is thickened, because shorter instruments allow safer work and because the field of operation is large. For the second part of the operation, only two or three somewhat longer chisels and the one or the other of the ordinary punch forceps are required.

The patient left the hospital in good condition. The vision in the right eye had improved and the other complaints were less. The feeling of pressure in the head and of thirst had decreased. The intake of fluid was not half as much as before. The parts of the hypophysis proved to be adenocarcinomatous. The patient became gradually totally blind, the headache increased and the child died four months later. Necropsy showed a tumor of the size of a pigeon's egg at the base of the cranium. It covered the anterior portion of the pons. The chiasma had completely disappeared in the tumor. Lautenschlaeger quotes the following advantage for his method:

1. The rapidity and ease with which the posterior wall of the sphenoidal cavity is reached without sacrificing important parts of the skeleton of the face.

2. The avoidance of larger resections and the possibility of reestablishing the previous condition in the nasal cavity in a simple manner after the operation.

3. The shortness of the route.

4. The exceedingly good view. The field of operation remains like a funnel and can easily be illuminated.

5. The little loss of blood permits any kind of narcosis and makes the complicating Kuhn's tubage superfluous.

6. The simple after-treatment.

7. The possibility of approaching the field of operation any time it is deemed necessary.

8. The comfortable position of the patient, and of the surgeon, which precludes fatigue.

AMBERG, Detroit.

FROM THE PROCEEDINGS OF THE GERMAN OTOLARYNGOLOGICAL SOCIETY, 1925

HYPNOSIS IN OTOLARYNGOLOGY. ALFRED PEYSER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:214, 1925.

Peyser believes there is a definite place for hypnosis. He suggests reeducating and activating the weakened will, but if all these psychotherapeutic ends fail, hypnosis, superficial or as deep as necessary, may succeed. He classifies suitable conditions as follows:

1. Local functional disturbances, combined with or following organic disturbance, that is, unusually severe pain; neuralgia after healing; post-tonsillectomy trismus; postoperative aphonia.

2. General disturbances: insomnia from tinnitus; loss of appetite from cacosmia.

3. Mental states or complexes induced by illness such as ozena, deafness and speech defects.

4. Phobias: syphilis, carcinoma and hereditary deafness.

5. Habits: ear scratching; nose picking; drug addictions.

6. Fear: of anesthesia; of operation. Removal of fear may enable use of local instead of general anesthesia.

Hofer has found it useful in nervous cough. Stern believes suggestion and reeducation are preferable to hypnosis in stuttering. Kuemmel sees danger in systematic hypnosis for tinnitus. Peyser also had good results in nervous cough. He agrees with Stern that hypnosis is not the best method for stuttering. He does not recommend it for tinnitus but for anxiety neurosis and insomnia resulting therefrom.

NEW OBSERVATIONS ON THE ANATOMY OF THE VOCAL CORDS. M. HAJEK, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:220 (Nov.) 1925.

Beneath the epithelium there is a thin propria which lies loosely on the elastic edge of the cord and is definitely delimited above and below at the point at which the squamous epithelium meets the ciliated. A definitely localized edema can be produced by injection of fluid in this region (Reinke). According to this author, a similarly definitely localized edema occurs in living subjects. Polyps and polypoidal thickening of the edge of the cord margin are the products of chronic inflammation of the distinctly outlined subepithelial tissue, with secondary changes in the same.

HISTOLOGY OF THE LARYNGEAL NERVES. V. STUPKA, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:228 (Nov.) 1925.

Stupka distinguishes large, medium and small medullated fiber bundles; of the last, four varieties. He also describes small nonmedullated nerves, naked axis cylinders and ganglion cells. The article is well illustrated with photomicrographs, and should be read in the original.

MECHANICS OF VOCAL CORD VIBRATION, AND OF SNORING. TONNDORF, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:241 (Nov.) 1925.

A stream of liquid, air or gas passing through a tube and encountering a narrowed place increases in speed with corresponding loss of pressure, even to a minus pressure, causing a "sucking in" at the point of greatest constric-

tion. The mathematical formula of this process is given. Illustrations of this principle are the steam injector and the atomizer. In the larynx, the same physical conditions are present, namely, the conical narrowing below the rima glottis. When the cords are in the position of phonation, the air stream first forces them apart, and as the narrowed stream passes through under increased speed but decreased pressure, the cords are sucked in together again, and the rapid repetition of this process produces sound. Elasticity of the cords is not necessary for mere sound, but functions in the production of pitch, modulation and clarity of tone.

The same explanation applies to snoring, which occurs when relaxation of the soft palate permits the inrushing air to suck it against the tongue if the mouth is open, or against the pharyngeal wall in nasal breathing when the passages are sufficiently narrowed.

The author demonstrates this by some simply constructed apparatus.

SINGERS' NODES AND VOICE DISTURBANCES. SOKOLOWSKI, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:246 (Nov.) 1926.

This author does not agree with Flatau that nodes may be temporary disturbances, but believes there is always some pathologic substratum. Imhofer's statement that all his patients recovered by rest and local applications alone, is not corroborated by the author's experience. He believes that all subjects who do not respond to two or three months' rest should be operated on, and the use of the voice in singing "over" the difficulty results in permanent injury which cannot be restored by operation. Rest not only of the singing voice but also of conversational voice, is indicated; otherwise it is useless.

PATHOGENSIS OF DYSARTHRIA SPASTICA. H. STERN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:278 (Nov.) 1925.

This author claims many stutterers suffer from vagotonia, and describes many symptoms associated with speech disturbances, for instance, anomalies of respiration, that are due to increased vagotonic irritability. Although he recognizes the psychic element, he believes vagotonia to hold an important causal relationship, and that this relationship is of greatest importance in the course, prognosis and therapy. He will publish a more detailed article elsewhere.

PATHOLOGY OF KERATOSIS PHARYNGIS. ANTHON, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:298 (Nov.) 1925.

This is essentially a cornification of the epithelium, not only of the crypts of the tonsils, but of those of the entire Waldeyer's ring. The leptothrix is recognized as a constant accompaniment of this condition, but not in a causal relation, but rather as a secondary inhabitant. Therefore the names "mycosis tonsillaris" and "tonsillitis leptothrixia" are misnomers. A careful histologic and bacteriologic examination has been made, and the author believes he has shown that an encapsulated diplobacillus of the Friedlander type is a constant accompaniment. While the Koch cycle has not been completed, the author suspects a causal relationship, if not with the cornification at least he feels sure that the loss of luster of the pharyngeal mucosa in keratosis is due to the well known mucus producing effect of this diplobacillus.

PATHOLOGICO-ANATOMIC FINDINGS IN CLINICAL LACUNAR TONSILLITIS. B. GROSSMANN and R. WALDAPFEL, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:323 (Nov.) 1925.

In sections of tonsils removed during the acute attack of lacunar tonsillitis investigators show that the inflammatory process is not limited to the cryptic region, but that the infiltration and destructive process associated with streptococci and gram-positive diplococci extend throughout the tonsil tissues. (Incidentally, the subjects suffered no ill effects from tonsil removal during the acute attack.)

THE CAUSE OF TONSILLOLITHS. EHRENFRIED, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:327 (Nov.) 1925.

Tonsilloliths are formed of calcium phosphate, while salivary stones and tooth stones are calcium carbonate. Ehrenfried found fungi on freshly removed tonsilloliths, and believes that fungi, because of their attraction for lime salts, may play an important rôle in causation.

INSULIN IN OTOLARYNGOLOGY. SPIES, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**: 334 (Nov.) 1925.

Spies uses insulin in so-called dry types of catarrh, even in ozena and pachydermia laryngis. Patients are first examined to make sure that blood sugar is up to normal (not under 0.08), and are given high carbohydrate diets, plus additional sugar several days before 3 to 5 units of insulin are used hypodermically daily or at longer intervals. Ampules of glucose solution for intravenous use are kept at hand, as is epinephrin and calcium preparations, but this investigator has not had any case of severe hypoglycemia.

CONTRIBUTION TO THE PHYSIOLOGY AND PATHOLOGY OF THE RESPIRATORY MUCOSA. H. STERNBERG, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:340 (Nov.) 1925.

Vasomotor changes of the nasal mucosa following mechanical, nervous and pharmacologic stimuli:

1. Compression of the neck veins dilates nasal mucosa vessels; clamping the common carotid causes temporary loss of volume, soon regulated by collateral circulation.

2. Sudden noises and pain cause constriction of vessels. Deep narcosis causes vasodilation. Irritation of the uterus and chilling the caudal extremity caused no definite changes.

3. Laryngeal reflexes influence alae nasi movements and cause hyperemia of nasal mucosa.

4. Only constrictor impulses are elicited by neck stimuli. The vidian nerve carries principally dilator impulses, but to a small extent constrictor impulses.

5. Cold irrigation of the ear causes constriction; hot irrigation causes dilatation.

6. Intravenous injection of preparations of the suprarenal and the hypophysis causes high grade constriction with loss of pulsation. Histamin caused dilatation of vessels by decreasing venous outflow. Barbital-sodium was constricting. Other drugs dilate.

7. Cocain paralyzes dilators and leaves constrictors to work without opposition. This explains its well known local constricting action.

LEWY, Chicago.

Society Transactions

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OTOLOGY AND LARYNGOLOGY

Nov. 18, 1925

FIELDING O. LEWIS, M.D., *Chairman*

SOME PHARMACOLOGICAL PROBLEMS OF LARYNGOLOGY. Presented by DR. HORATIO C. WOOD, JR. (by invitation).

Dr. Wood called attention to the new grouping of silver compounds in the revised pharmacopeia. Those relatively low in silver content, about 8 per cent., of low specific gravity, and lighter in color being classified in the first group termed argentum proteinum fortus. The second group, argentum proteinum mite, includes the thick, viscid preparations containing approximately 20 per cent. of silver. The protein silver combinations probably owe their germicidal superiority to a slow but continuous liberation of ionic silver.

Various local anesthetics were considered, and the two groups of toxic phenomena discussed, that is, convulsions and syncope. In the treatment of syncope following the administration of a local anesthetic, Dr. Wood considered epinephrin chlorid intravenously and artificial respiration to be of great importance and value. Pituitary products, too, are efficacious. Attention was called to the fact that the speed of injection of the anesthetic is an important factor. As a rule, the slower the injection the less the danger of poisoning.

Benzocaine, a comparatively new local anesthetic, nonsoluble in water, was mentioned. This preparation has very little toxic action and is of especial value when used as a dusting powder in ulcerative throat conditions.

DISCUSSION

DR. GEORGE FETTEROLF asked the opinion of Dr. Wood as to the best antiseptic for small circumscribed skin infections, such as aural furuncles.

DR. JAMES A. BABBIT requested further information concerning the action of a local anesthetic combined with epinephrin solution.

DR. WOOD said that tincture of iodin applied to the skin would penetrate deeply, and would disinfect a furuncle probably better than any other surface application. A saturated alcoholic solution of menthol has been used with success by some physicians.

Dec. 16, 1925

SOME COMPLICATIONS OF EAR, NOSE AND THROAT DISEASES AND OPERATIONS. Presented by DR. JOSEPH C. BECK (by invitation).

Dr. Beck, in a forceful and vivid manner, drew verbal pictures of the various complications of ear, nose and throat conditions. Illustrative cases cited from his own rich personal experience served to make his remarks all the more lucid and impressive. It is to be hoped that Dr. Beck will see fit to publish his paper, and make the many valuable facts contained therein available for all. This abstract can be but a mere skeleton of the original paper.

He spoke of the present day tendency of some operators, especially the quack and near-quack, to perform plastic operations for trifling nasal irregularities. When valid operative reasons do not exist, operations for cosmetic purposes are to be condemned. In contrast to such patients are those having conditions really indicating plastic surgery. Here results are gratifying and well worth the effort.

The types, management, and diagnosis of sinus disease complications were discussed. The tonsil question was considered and emphasis was placed on the necesssity of complete enucleation of the tonsil if the surgeon expects to relieve his patient of the symptoms of focal infection. Attention was called to the occasional case of pemphigus which shows laryngeal evidence of the disease before the appearance of skin lesions. Specific laryngeal conditions, acute laryngitis, laryngeal rhinoscleroma, papilloma, and malignancy were briefly but ably presented.

DISCUSSION

Dr. George Fetterolf considered the paper read to be a splendid, compact postgraduate course in laryngology, presented by one whose experience gave authority to his opinions. In speaking of death during exploratory puncture of the maxillary sinus, it was the feeling of Dr. Fetterolf that perhaps air embolism was made possible by the needle penetrating a blood vessel of a septum within the sinus. The introduction of air into the sinus through the needle was condemned.

Dr. James A. Babbitt asked the opinion of Dr. Beck concerning the types of veins in the region of the nose and their bearing on the transmission of infective material when the nose is the seat of a septic process such as a furuncle.

Dr. George B. Wood too condemned the introduction of air into the maxillary sinus. Attention was called to the pharyngo-maxillary space as a danger point of infection in local tonsillectomy. The introduction of infective material into this space at the time of injection may produce an abscess in this region.

Dr. Lewis asked Dr. Beck to tell of his experience in the use of mercurochrome-220 soluble in blood stream infections.

Dr. Beck said that he has used mercurochrome intravenously in nine cases of sepsis. Five of the patients recovered. The absence of valves in the nasal veins probably accounts for the ready transmission of septic material from this region.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

November Meeting, Nov. 19, 1925

Harry L. Pollock, M.D., *in the Chair*

THE DEAFENED

Social Service Work Among the Deaf. Presented by Dr. Wendell C. Phillips.

Dr. Phillips, President-Elect of the American Medical Association, was introduced by the Chairman, and expressed his pleasure at being a guest of the Chicago Laryngological and Otological Society and his interest in the program to be presented. He said that there was a phase of otology that

should come very close to the heart of the otologist, but which was shown to a slight degree; that is, the social service work among people afflicted with deafness. By this he referred to organized effort to bring the deafened people opportunities for education, for proper occupation and for social rehabilitation. He devotes considerable time to work among the deaf through the New York League for the hard of hearing. There are hundreds of children in every city with defective hearing whose hearing can be restored if they are discovered in time. A great deal of satisfaction will come from such work.

He expressed his appreciation of the honor which had been conferred on him by the medical profession of this country, and stated that it was a satisfaction to know that he was the first otolaryngologist to be president of the American Medical Association.

STATISTICAL STUDIES OF THE CHILDREN IN THE CHICAGO PUBLIC SCHOOLS FOR THE DEAF. (ABSTRACT.) Presented by DR. GEORGE SHAMBAUGH.

These studies were undertaken for the purpose of determining what light, if any, could be thrown, from the study of statistics, on the many questions relating to the children in our institutions for the deaf, such questions as the occurrence of partial or total deafness, questions of the relations of these to congenital and acquired cases, the relation between those occurring with otitis media and those which developed quite independent of this process, statistics in the etiology of acquired deafness. Various charts were devised, setting forth in a graphic manner the full relationships which were studied.

A brief summary of the general conclusions are expressed as follows:

1. Exactly one-half of the children examined were found to be congenitally deaf, while the other half had acquired ear trouble.

2. Total deafness existed in 57.9 per cent of the congenital cases and in 35.2 per cent of the acquired cases.

3. Partial deafness was found in 42.1 per cent of the congenital cases and in 64.8 per cent of the acquired cases.

4. Vestibular responses were present in 75.1 per cent of the congenital cases and in 72.93 per cent of the acquired cases.

5. Vestibular responses were absent in 24.9 per cent of the congenital cases and in 37.93 per cent of the acquired cases.

6. A total absence of vestibular responses and total deafness were found in 17.5 per cent of the congenital cases and in 26.2 per cent of the acquired cases.

7. Presence of vestibular responses and total deafness were found in 40 per cent of the congenital cases and in 8.2 per cent of the acquired cases.

8. Absence of vestibular responses and partial deafness were found in 6.2 per cent of the congenital cases and in 11.03 per cent of the acquired cases.

9. Presence of vestibular responses and partial deafness were found in 34.5 per cent of the congenital cases and in 53.08 per cent of the acquired cases.

DR. J. W. HOLDERMAN presented a series of children with acquired deafness associated at onset with otitis media, showing subjects with total deafness with vestibular responses still active; total deafness with vestibular responses gone; partial deafness with normal vestibular responses; partial deafness with no vestibular responses. Dr. Holderman also showed a group of four children in one family, all congenitally deaf with no history of deafness in the family, but with the parents being first cousins.

Dr. Alice K. Hall presented a series of children congenitally deaf, showing partial deafness with vestibular responses normal; partial deafness with vestibular responses gone; total deafness with vestibular responses present and total deafness with vestibular responses absent.

Dr. E. W. Hagens presented a series of cases of acquired deafness not associated at onset with otitis media, showing cases of total defects in hearing with vestibular reactions still present; total defects in hearing with vestibular reactions absent; partial defects in hearing with vestibular reactions gone and partial defects in hearing with vestibular reactions present.

DISCUSSION

Dr. Charles W. Richardson, Washington, D. C., said the survey of the deaf institutions of the country was quite an important piece of work. Efforts have been made for the past five years to bring about this survey. The attempts to engage the aid of any of the national agencies who could furnish financial aid had failed, and those who were interested in the work were quite in despair. About this time two interested people, unknown to each other, consulted the National Research Council. One of these was Dr. Hall of Gallinet College in Washington, and the other was Dr. Richardson; they were able to interest the Council to such an extent that they were invited to a meeting of the Educational Division. The Council then appointed a committee of five members representing this particular field of investigation to take up the survey. It was found at this meeting that the medical side had not been taken seriously into consideration, and that other surveys had absorbed practically all the funds. The work then was taken up by Dr. Richardson as a voluntary service and he enlisted the aid of other otologists in the country. He thought a good deal of admirable work had been done, and paid all honor and respect to Dr. Shambaugh in telling him that his work was a success in every respect. The work of Dr. Rinder of Buffalo had likewise been perfect.

A more intensive study is to be made of these cases. With the plan Dr. Richardson had in mind, he expected to study from 4,000 to 6,000 cases, which will develop a great deal of material in connection with the physical survey of the deaf. Many questions will be solved — the amount of residual hearing, the relation of acquired and congenital deafness as to their reactions to vestibular and cochlear function. The amount of residual hearing is an important question, as is also the audiometer reactions to both the acquired and congenitally deafened. It will be possible to make Wassermann tests on all patients and to solve many problems in regard to specific infection in these patients. Consanguinity also can be studied.

He agreed with Dr. Shambaugh in the statement that removal of the tonsils is not productive of any improvement in hearing, and believed that in many cases of toxic origin caused by the tonsil, the harm is done before the tonsils are taken out.

Dr. Wendell C. Phillips, New York City, complimented Dr. Shambaugh for the efficient way in which he and his assistants accomplished this difficult piece of work. He also complimented the Society for having men and women who were able to do work of this kind.

This work in New York City has not progressed so far, but will probably be accomplished soon.

He endorsed everything, even the conclusions, that Dr. Shambaugh gave. Regarding the comments on the tonsil operations as a cure for deafness, he was not sure but perhaps Dr. Richardson was right.

He regretted that Dr. Shambaugh found it necessary to use the word deafness in this connection. A working classification, so far as education is concerned, might be deafness without normal speech and deafness with normal speech. It is true that many of the cases of profound deafness in children sufficient to require education in institutions or special schools for the deaf, may be acquired, but this class is extremely limited so far as percentage is concerned. The far larger class mentioned under the heading of acquired deafness with speech was not included in Dr. Shambaugh's report, and this type of child should always be educated in the regular schools, plus proper preventive treatment and instruction in lip reading.

Dr. Robert Sonnenschein called attention to the phase of heredity, and cited the work of Edward A. Fay in which he reported 4,400 families in which one or both parents were deaf. There were 6,700 children, of whom 8.6 per cent were deaf. When both parents were deaf, 24 per cent of the marriages resulted in deaf children and over 25 per cent of the children were deaf. When the parents were related, 45 per cent of the marriages resulted in deaf children and 30 per cent of the children were deaf. Dr. A. G. Bell, in a survey of 300 marriages of the deaf, found 56 per cent of the children deaf.

Dr. John J. Theobald said he supervised the examination of the ears of 10,000 children in the public schools for the Chicago League for the hard of hearing. Three years ago a survey was made by him under the direction of Dr. Norval H. Pierce. A whisper test was made on every child, and those not hearing in both ears at 20 feet, underwent a more detailed functional examination. Usually, inflation sufficed to restore the hearing to normal. When this failed, careful inspection by otoscopy and rhinopharyngoscopy was carried out, and the exact nature of any defect was recorded. Some of the subjects were sent to their physician, others were taken to the free dispensaries by follow-up workers connected with the League. A few were advised to take up lip reading. The large number found to have defective hearing so impressed the League, the Department of Education and the doctors, that it was unanimously decided this work must go on.

In seven schools in which they had completed their records, 7,538 children had been examined by the teachers. Further detailed examinations revealed the following:

Tubo-typanal catarrh (mild), 93; tubo-tympanal catarrh (advanced), 66; chronic suppurative otitis media, 42; nerve degeneration, 7; cerumen (impacted), 63; total, 271.

Thirteen had stapes fixation and twelve were advised to take up lip reading.

The investigation had proved that the examination of all school children's ears is necessary, and this is obviously the duty of the Board of Health and the Board of Education. There are over 300 schools, and it would require too long a time for the League, with its limited resources, to go through them all.

The first duty is to detect the hard of hearing child and the next, equally important, is to see that he gets the proper care. More time is required to carry out the latter phase of this work than the former, and it is here that the authority of the Department of Education is needed most to overcome the inertia shown by parents of the afflicted child.

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CONTENTS

PAGE

Cancer of the Larynx. J. E. MacKenty, M.D., New York.. 205

The Development of the Membranous Labyrinth. George E. Shambaugh, M.D., Chicago..... 233

Malingering Deafness: Tests in Its Detection and Report of Two Cases. J. Coleman Scal, M.D., New York..... 237

A New Method for Testing Hearing. Samuel Cohen, M.D., and David Nussbaum, M.D., Philadelphia..... 242

Some Recent Otologic Problems. F. R. Nager, M.D., Zürich, Switzerland 252

Acute Pemphigus of the Throat, with Positive Vincent's Angina. H. A. MacGruer, M.D., and A. H. Rubenstein, M. D., Syracuse, N. Y..... 259

Clinical Note:

Teratoma of the Throat. Albert E. Bulson, Jr., M.D., Fort Wayne, Ind..... 262

Progress in Otolaryngology. A Summary of the Bibliographic Material Available in the Field of Otolaryngology. Peroral Endoscopy. Louis H. Clerf, M.D., Philadelphia 265

News and Comment:

Pacific Coast Oto-Ophthalmological Society..... 282
American Board of Otolaryngology..... 282
Annual Meetings 282
Local Society Meetings..... 282

Abstracts from Current Literature..... 284

Society Transactions:

College of Physicians of Philadelphia, Section on Otology and Laryngology..... 296
Chicago Laryngological and Otological Society..... 297